DESIGN, CONSTRUCTION, OPERATION OF METAL-WORKING AND ALLIED EQUIPMENT

MACHINERY

JUNE, 1945

PRINCIPAL CONTENTS OF THIS NUMBER

For Complete Classified Contents, See Page 232

The European War is over and production of certain types of fighting aircraft has been curtailed, but there has been no curtailment in the development of new manufacturing methods for turning out Superfortresses, jet planes, and other types of aircraft required to bring the Japanese to terms. MACHINERY'S annual Aircraft Production number, to be published in July, will describe some noteworthy new processes and unique applications of older methods. These processes and methods offer wide possibilities to the machine-building and metal-working shops of other industries for the solution of post-war manufacturing problems.

Volume 51
Number 10

DEPARTMENTS

Product Index 440-458
Advertisers Index 461-462

TOTAL DISTRIBUTION
20,625

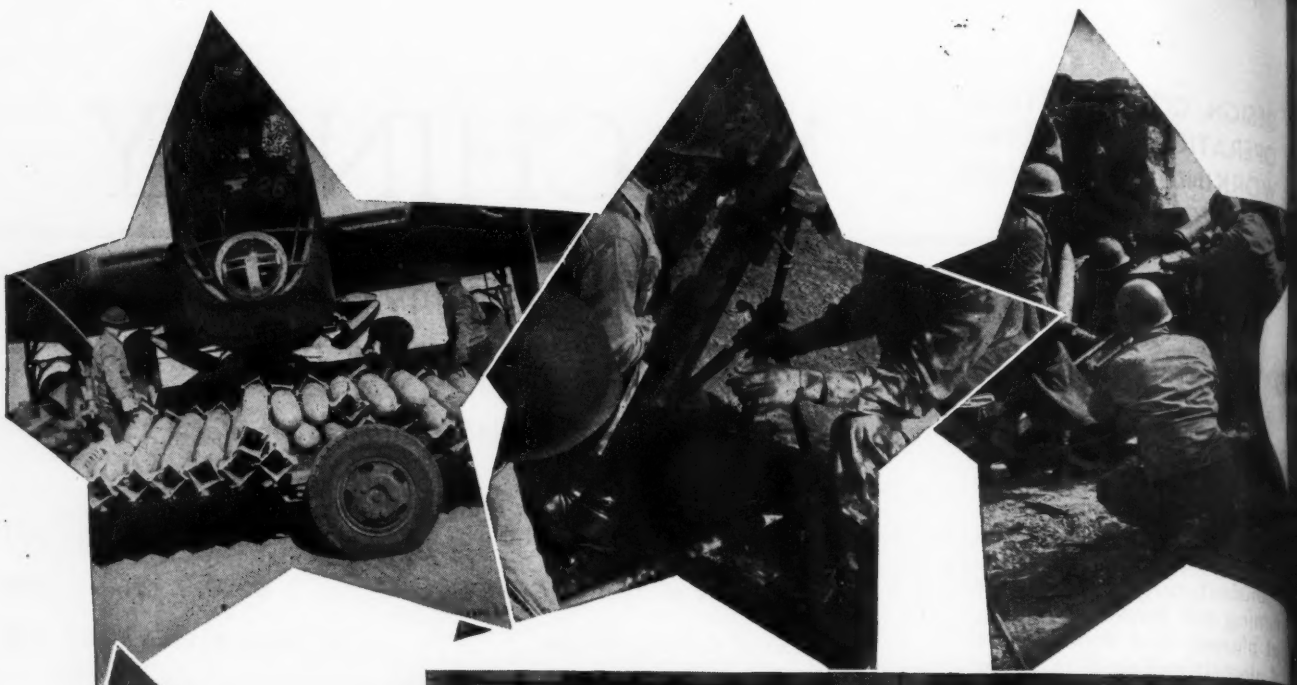
PUBLISHED MONTHLY BY
THE INDUSTRIAL PRESS
148 Lafayette Street, New York 13, N. Y.

ROBERT B. LUCHARS.....*President*
EDGAR A. BECKER ...*Vice-pres. and Treasurer*
ERIK OBERG .....
FRANKLIN D. JONES..... *Editors*
CHARLES O. HERB.....*Managing Editor*
FREEMAN C. DUSTON.....*Associate Editor*
HOLBROOK L. HORTON.....*Associate Editor*
WALTER E. ROBINSON, *Advertising Manager*

BRIGHTON, ENGLAND
MACHINERY, 17 Marine Parade

SUBSCRIPTION RATES: United States and Canada, one year, $4; two years, $7; three years, $8 (for Canada add 25 cents per year for war tax); foreign countries, $7 a year. Single copies, 40 cents. Changes in address must be received by the fifteenth of the month to be effective for the next issue. Send old as well as new address.

Entered as second-class mail matter, September, 1894, at the Post Office, New York, N. Y., under the Act of March 3, 1879.
Printed in the United States of America.
Member of A.B.P. Member of A.B.C.



The Landmaco Threading Machine threading ce
containers for 60 mm trench morta

LANDIS
WAYNESBORO

MACHINERY

Vol. 51 No. 10 June, 1945

Forging and Machining Track Links for Army Tanks

Methods Developed by Buick for Producing All-Steel Links for the Tracks of Tanks, Tank Destroyers, and Other Track-Laying Military Vehicles

By CHARLES O. HERB

ONE of the most powerful weapons of the Army Ground Forces in winning their victories in the battle of Europe was the "Hellcat," a tank destroyer of exceptional maneuverability having a speed up to 55 miles an hour and carrying a 76-millimeter gun of high velocity and destructive fire power. This military vehicle was designed and manufactured by the Buick Division of the General Motors Corporation in cooperation with the Army Ordnance Department and the Tank Destroyer Command. A number of unique features embodied in the "Hellcat" have since been incorporated in the construction of other types of fighting equipment built both at the Buick plant and by other companies.

One of the outstanding features that made the "Hellcat" such a potent factor in our European victories is the endless all-steel forged track. The combination of the track design and a new type of suspension has made it virtually impossible to "throw" the track from any vehicle in making sharp turns at high speed, which was one of the difficulties encountered with our earlier fighting equipment. Another advantage is the long service life of this track and the sprockets that drive it.

Each track consists of eighty-three steel drop-

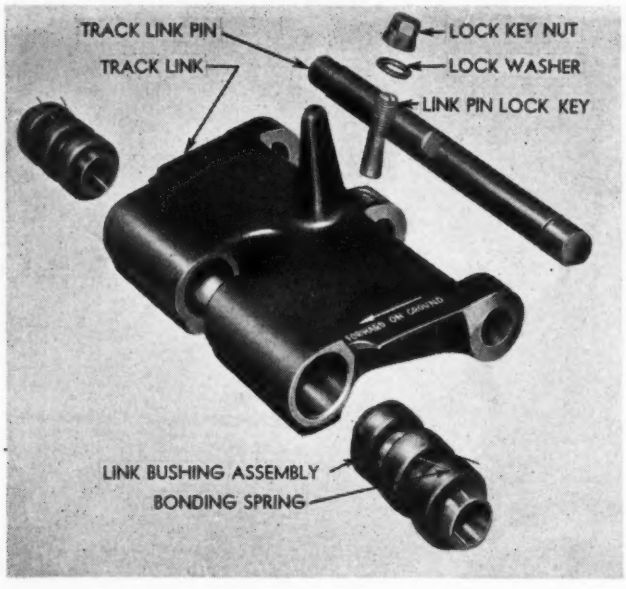
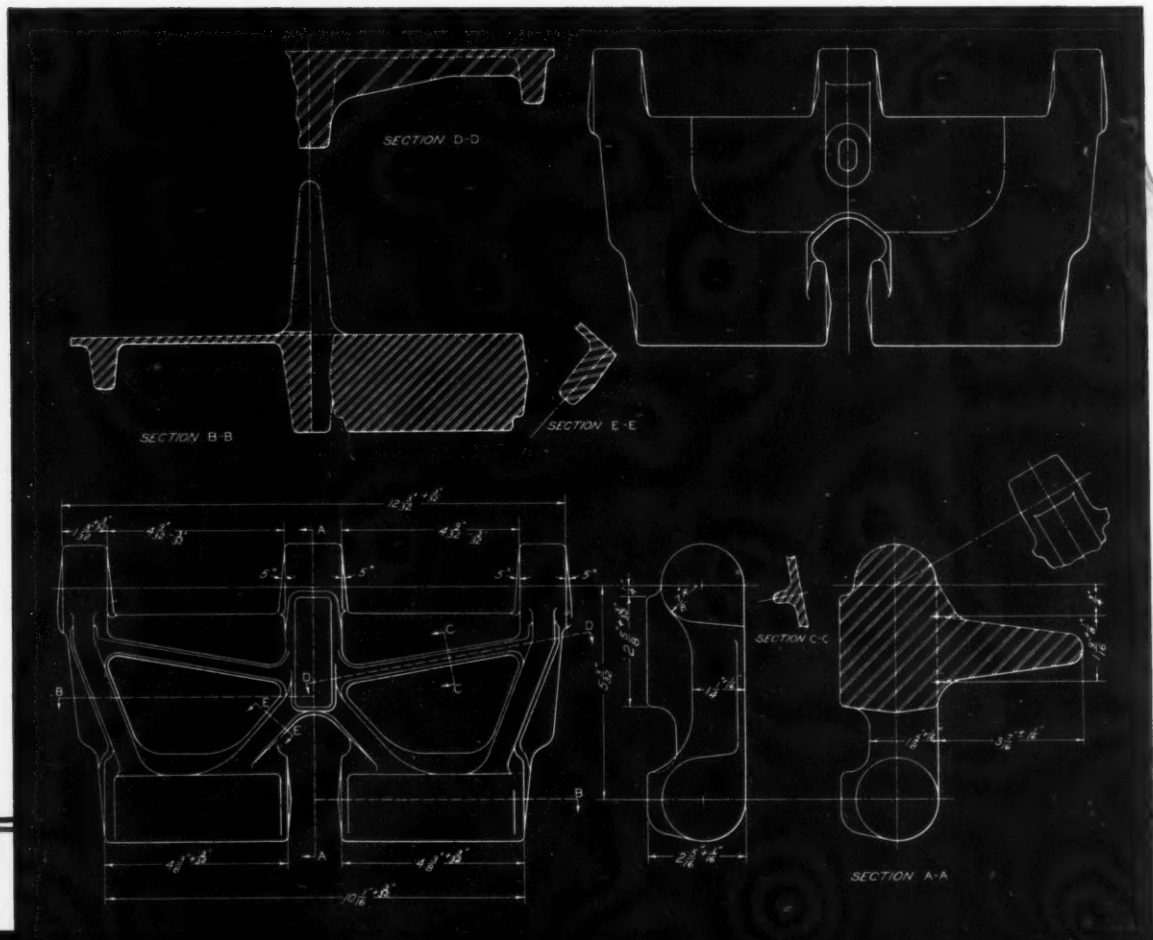


Fig. 1. The Link and Its Component Parts, which Make up the "Unthrowable" Track Now being Provided on Various Types of Military Vehicles

forgings, which are made practically wearproof by a deposit of Colmonoy wear-resistant alloy on the treads. A distinctive feature of the track links is a high center guide or lug that is forged integral with the top side. This lug meshes with the track wheels and also with the support rollers. In addition, the lugs clean out mud and other material that tends to collect between the wheel disks. Still another feature of this track is the employment of long track pins which project from each side of the links. These projecting ends mesh with the teeth of the driving sprockets.

The design of the track links will be apparent from Fig. 1, which shows all the parts that make up a single assembled link. On the under side of each link there are a number of pockets with separating webs, designed to provide a grip on soft ground, and three large bosses at the points of contact with the ground, on which the Colmonoy is deposited. The construction will be understood from the drawing of the link forging, Fig. 2. Fig. 3 illustrates how the links are assembled together to produce a complete track. The operations involved in forging, heat-treating, and machining the links, as well as in depositing the Colmonoy, described in this article, are of unusual interest.

Fig. 2. Forging Drawing of the Track Link in Fig. 1, Giving Details of the Guide Lug and Various Pockets, which Presented Problems in the Development of the Drop-forging Dies



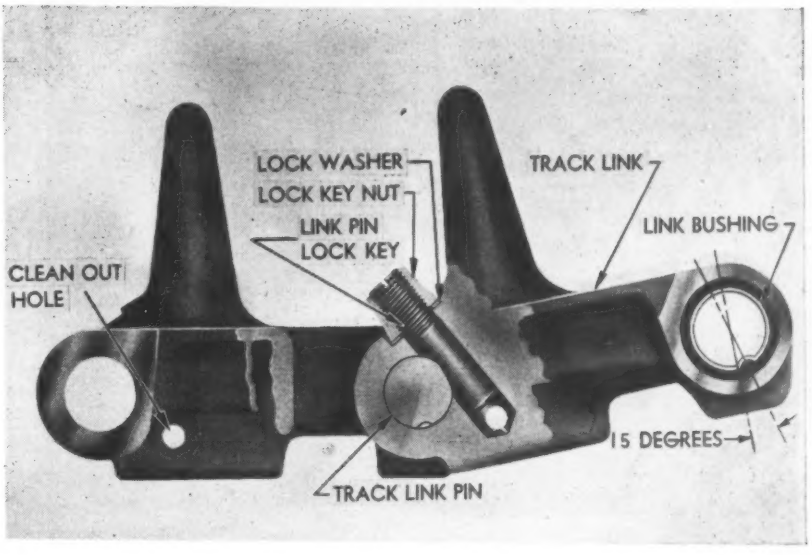


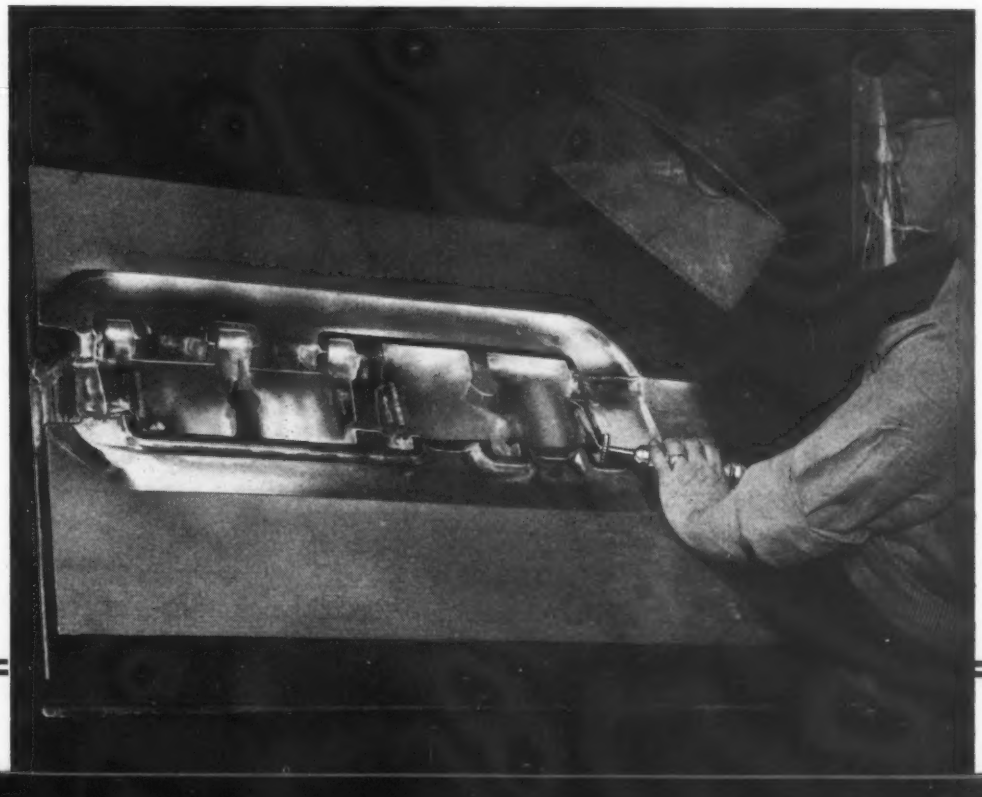
Fig. 3. View of Two Assembled Track Links Showing the Method of Assembly. Note the Method of Locking the Link Pin Securely in Place

★

The track links are drop-forged two at a time from S A E 1340 manganese steel on 12,000- and 16,000-pound drop-hammers. From the close-up view of an upper die, Fig. 4, it will be obvious that two forgings are made end for end on a billet. An actual forging operation is shown in Fig. 5, from which it will be obvious that the high central guide lugs are formed in the upper die. The cavities in which the lugs are forged are provided with vent-holes that lead from the bottom of the cavities to the top of the upper die, so as to release the air that would otherwise be trapped in the cavities during a forging operation.

The first step in the forging process consists of taking a heated billet from a pusher type furnace, in which it has been brought to a temperature of approximately 2350 degrees F. The billets are of a 3 1/4-inch square cross-section with rounded corners, and are 25 1/2 inches long, exclusive of the tong-hold, which is 5 inches long. The hot billet is immediately transferred to a hammer provided with blocking dies, where blows are first struck across the corners

Fig. 4. View of Upper Half of a Die Used in Drop-forging the Track Links, from which It will be Apparent that Two Links are Forged End for End at One Time from the Same Billet



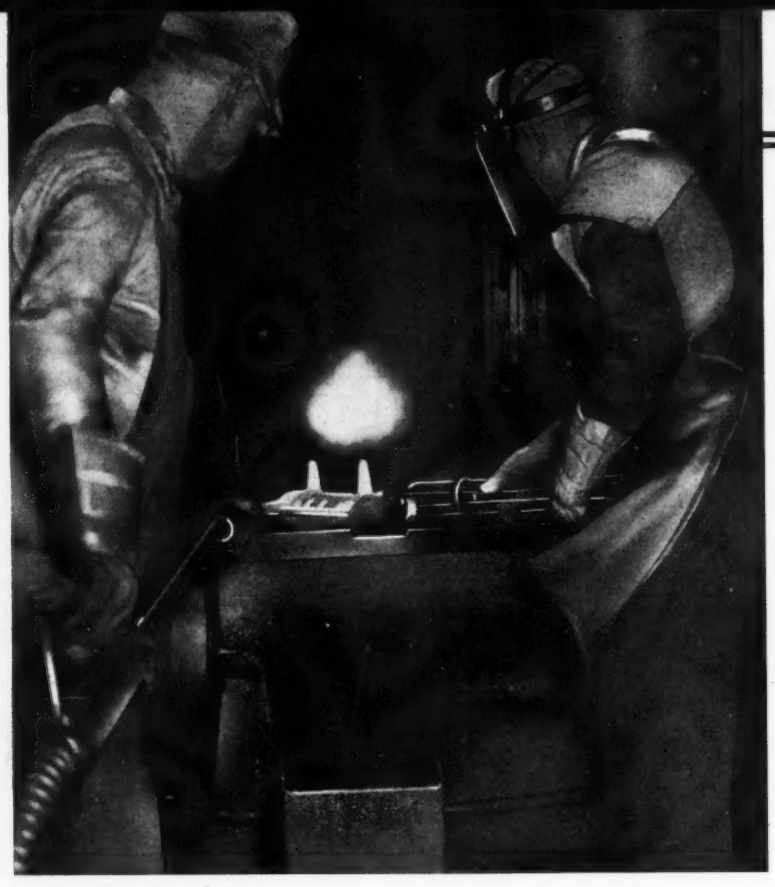


Fig. 5. (Left) Finish-forging the Double-link Drop-forging under a 16,000-pound Drop-hammer

★

Fig. 6. (Below) The Track Links are Carried through a High-heat Furnace at the Beginning of a Heat-treating Process

of the billet to knock off the scale. Then the billet is hammered to an elliptical cross-section and blocked in the same dies to the rough outline of the link drop-forging. About three blows are struck in blocking.

The rough forging is next transferred to the finish-forging hammer, which is the one illustrated in Fig. 5. The forging already fits the finishing die impressions fairly close, and is usually hammered to size with three blows of this hammer. In machining the roughing and finishing dies in the die-room, an allowance of about 3/16 inch per foot is made for shrinkage as the drop-forging cools. Steam is blown constantly across the bottom die face on both the roughing and finishing hammers, so as to keep the dies clean of scale.

Upon removal from the finish-forging dies, the forging is transferred to a press equipped with a trimming die, as shown in Fig. 7. All the excess material, including the tong-hold and the metal between the two links, is cut away here. The two links drop through the die as separate parts and fall on a spring-supported plate within the die base, from which they are readily removed by a helper at the rear of the press. The scrap falls outside the trimming die. The forgings are approximately 12 inches long by 7 1/4 inches wide, and weigh 20 pounds each. The machining operations performed later on

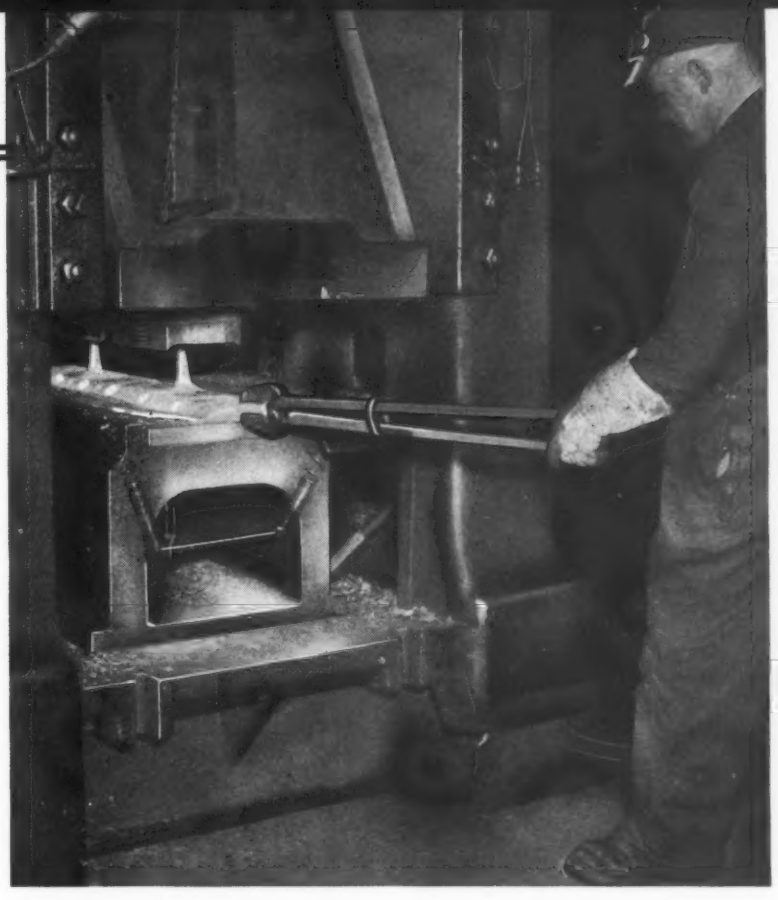


Fig. 7. (Right) The Drop-forging is Trimmed to Remove All Excess Material and Cut the Two Links Apart

★

Fig. 8. (Below) Electric Arc-welders are Employed to Combine Colmonoy Paste with the Parent Metal of the Forgings

the forgings reduce their weight to about 15 pounds.

The trimmed forgings next pass through a heat-treating process. For this process, the links are stacked three high on trays and loaded into a furnace in two rows on a conveyor, as seen in Fig. 6. There are eight links on each tray, and there are twenty-two trays of work in the furnace at one time. The furnace is constructed with two heating zones, which are maintained at a temperature of 1575 degrees F. It takes 2 1/2 hours for each tray of links to travel the length of the furnace.

When the trays reach the far end of the furnace, an automatically operated unit removes them on arms, and then during a revolution of the tray removing device, the track links are dumped from the trays into an oil quench. The trays are automatically deposited on a rack, from which they are conveniently withdrawn by a man and returned to the front of the furnace for successive use.

The oil quench tank is about 6 feet deep, and the oil is maintained at a temperature of between 135 and 145 degrees F. An inclined metal conveyor of the same width as the furnace and the tank brings the links out of the quench and dumps them on a table at the front of a second furnace, which is used for tempering the links. The links are loaded by hand on a conveyor,

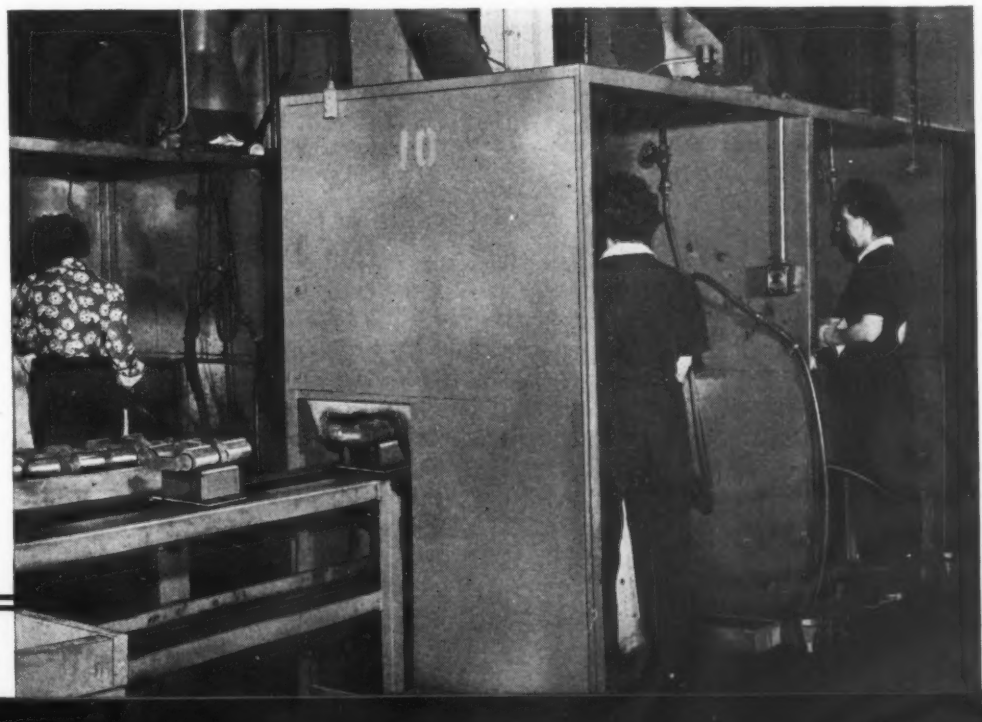


Fig. 9. (Left) Applying Colmonoy Paste at Three Points on the Tread Side of the Track Links prior to a Puddling Operation, which Greatly Improves the Impact and Wear Resistance Properties of Tread

Fig. 10. (Below) Duplex Machine Equipped with a Multiple Number of Drills and Reamers for Machining Bearings on the Track-link Forgings to Receive the Long Link Pins

which carries them through the three heating zones of the furnace, which are held at a temperature of 1220 degrees F. The track links remain in this furnace for three hours. The time for the entire heat-treating process, including quenching, consumes about 7 1/2 hours. The track links are cooled in air. The heat-treatment gives them a hardness of between 370 and 400 Brinell.

The wear-resisting Colmonoy is deposited on the treads of the track links prior to machining. It is applied in paste form, as illustrated in Fig. 9, a sheet-metal templet being first placed over the track link and the Colmonoy then spread across the templet openings with a putty knife. Before applying the paste, the link surfaces are wire-brushed to remove all dirt and loose scale. There are three deposits of Colmonoy on each link, two of which cover an area of about 4 inches by 3/4 inch each, and the other an area of 2 3/8 inches by 5/8 inch. The paste is applied to a height of between 1/16 and 1/8 inch.

Six of the track links with the applied paste are placed at a time on a similar number of fixtures on a conveyor that extends through a group of three booths provided with electric arc-welding equipment for "puddling" the Col-

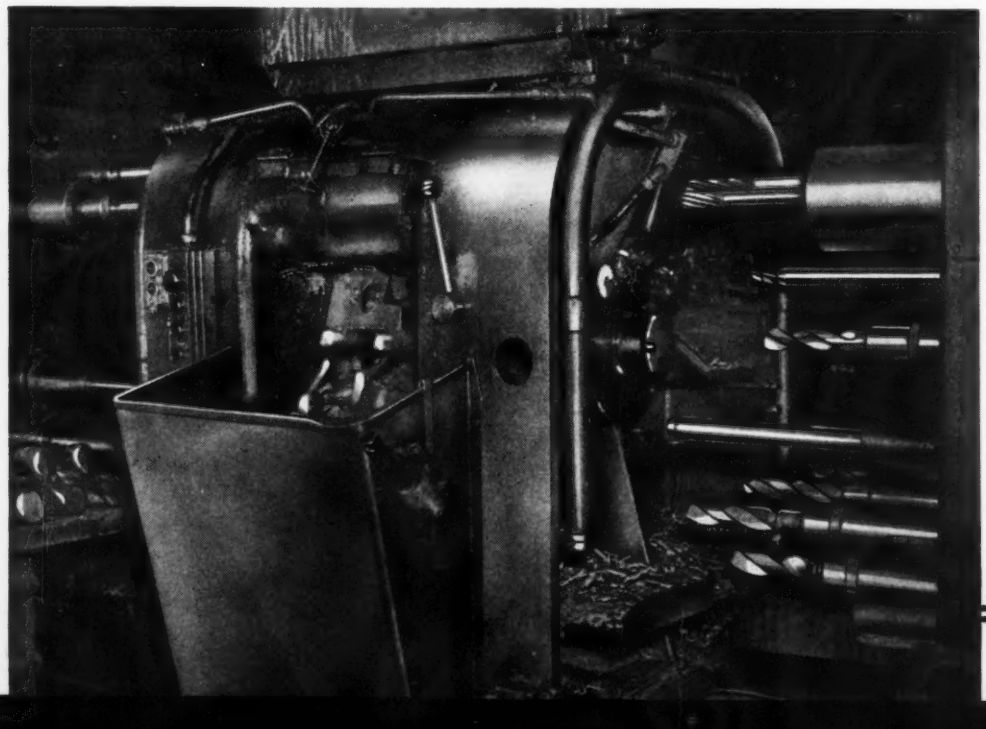


Fig. 11. In Employing Electric Arc-welding Equipment for the Operation in which the Colmonoy Paste is Combined with the Parent Metal of the Link Forgings, the Operator is Amply Protected from the Arc

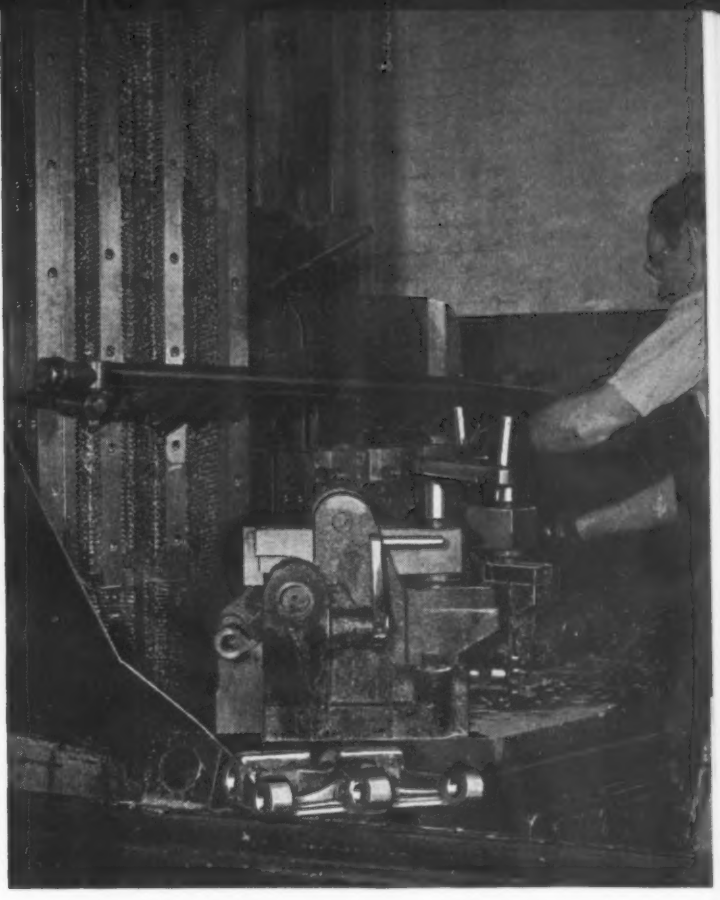


Fig. 12. The First Broaching Operation on the Forged Track Links Consists of Broaching Clearance between the Short Link Pin Bearings and Rough-machining the Faces of These Bearings

monoy. The fixtures are so spaced on the conveyor that there are two for each booth. Fig. 8 shows one of these groups of booths and its conveyor. By loading six fixtures at a time, three links can be fed to the three welding operators and the conveyor stopped. Then, with another short movement of the conveyor, three additional links can be brought into position.

The temperature of the electric arcs is over 6000 degrees F. for this "puddling" operation, which insures a temperature of at least 3200 degrees F. in the puddle formed by melting the Colmonoy paste and the parent metal of the link with which the elements in the paste are to be combined. The end of the carbon electrode is always held about 1/4 inch above the work, and is gradually moved back and forth across the work and advanced until the entire length of the surface being treated with Colmonoy has been properly puddled. It requires about 1 minute 10 seconds to puddle each of the large spots.

Fig. 13. Second Broaching Operation in which All Faces of Link Pin Bearings are Finished by Using Successively Broaches on the Left- and Right-hand Slides

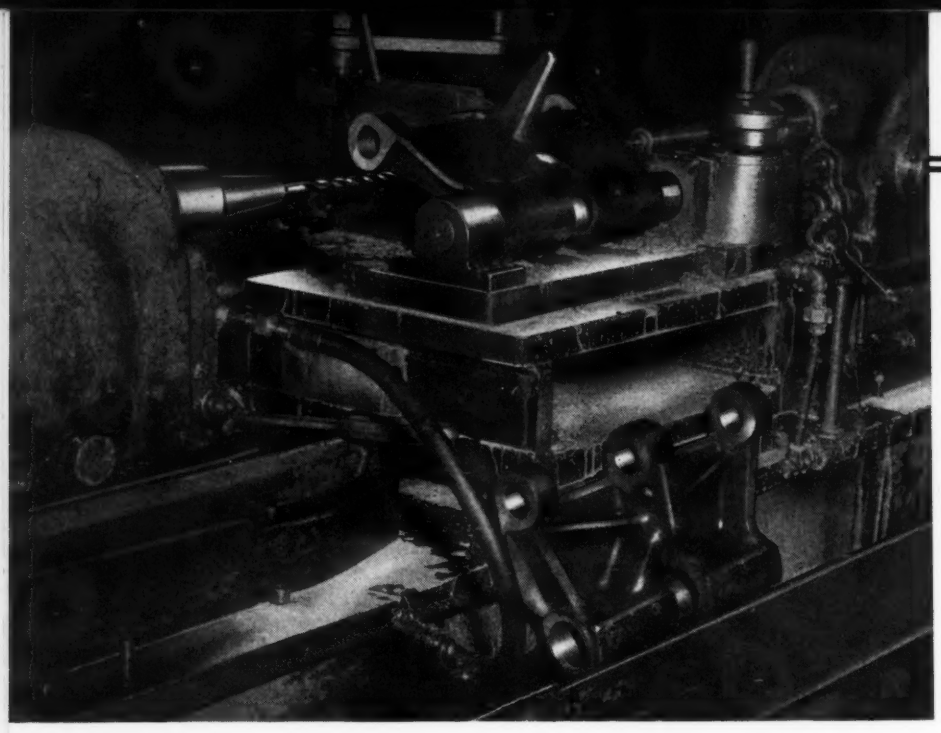


Fig. 14. Drilling of the Clean-out Hole, which Extends through a Central Arm, is Performed with Long Drills in This Duplex, Hydraulically Operated Machine

★

In Fig. 11 is seen one of the girl operators performing a "puddling" operation. She observes the operation through dark glass windows as she manipulates the welding torch through a canvas-covered slot in a housing which encloses the track link, as well as the working end of the welding torch. Portable welding machines of 400 amperes are used for these operations. Both 1/4- and 5/16-inch diameter solid carbon electrodes are employed. The electrode-holders are water-cooled.

The combined Colmonoy and parent metal extend to a depth of about 1/8 inch into the link forging and have a hardness of 65 Rockwell C. This high degree of hardness is due to the fact that the Colmonoy paste consists of diamondlike crystals of chromium boride distributed through a hard metal matrix. By combining the chromium-boride crystals with steel, increased resistance to impact and abrasion is obtained, as well as an increase in corrosion resistance.

The first machining operation consists of drilling and reaming the link pin holes through the two long bearings on one side of the link, as shown in Fig. 1, and the three shorter bearings or supports on the opposite side. The holes in the long bearings must be finished to a diameter of between 1.651 and 1.661 inches, and the holes in the short bearings to limits of 1.124 and 1.126 inches.

Drilling and reaming of all holes are accomplished on six-station machines of the type illustrated in Fig. 10. Duplicate tools are provided on the duplex heads at the opposite end of the machine for practically all stations, with the exception that reamers for the holes in the short bearings are provided on the right-hand head only. These reamers are sufficiently long to line-ream all three bearings.

One station of the machine is used for loading purposes only. From that station the work-carrier is indexed downward, where the outer

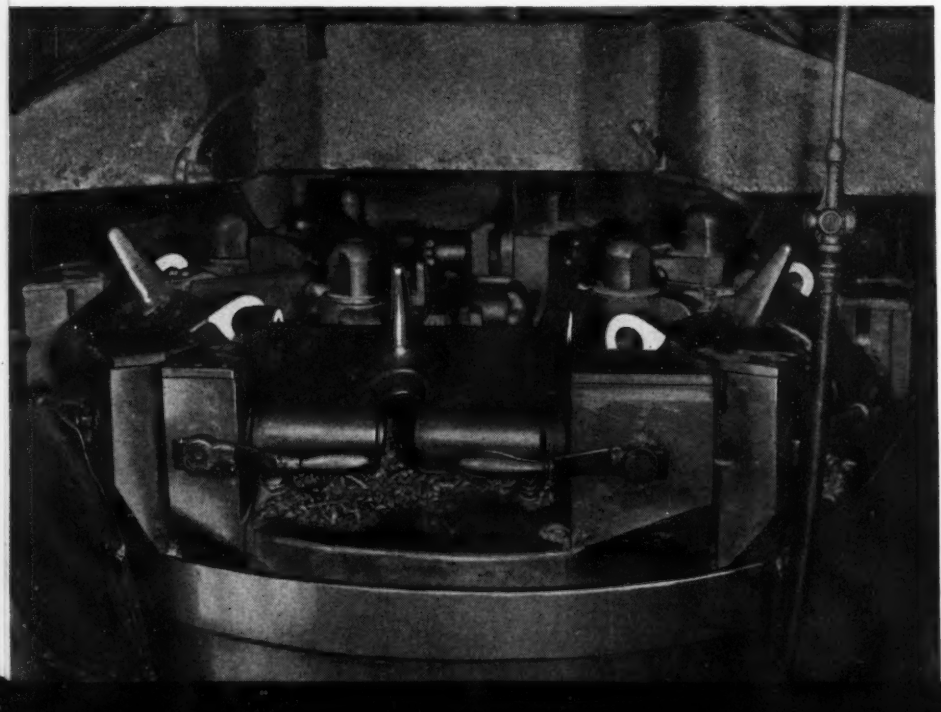


Fig. 15. Six-station Vertical Machine Tooled up for Drilling, Reaming, and Counterboring the Lock-pin Hole in the Track Links

★

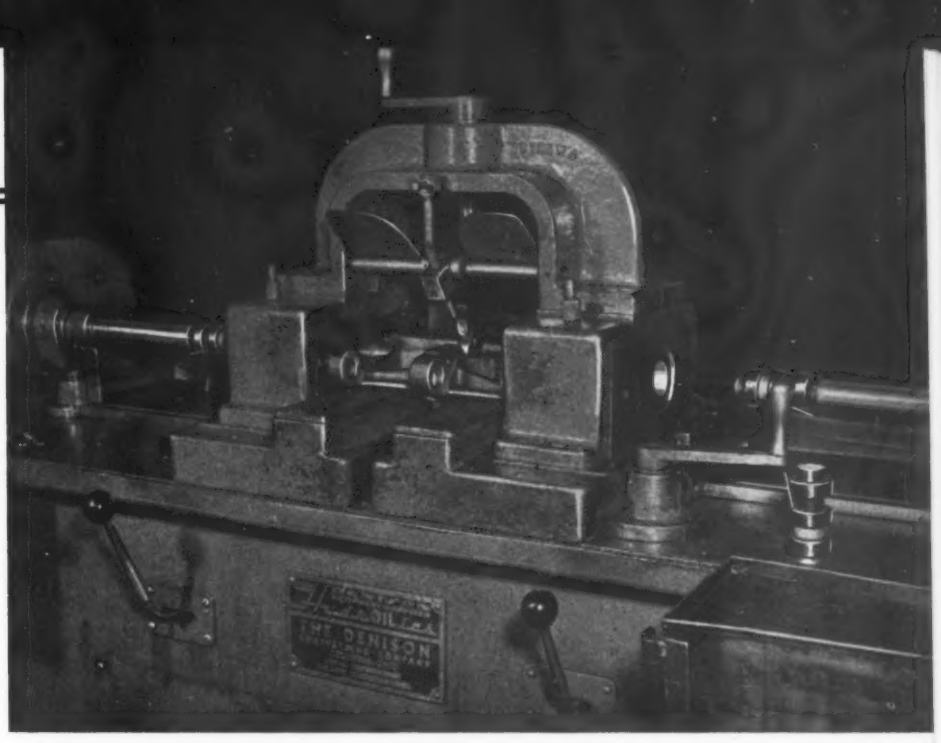


Fig. 16. Hydraulically Operated Equipment Used for Pushing the Bushing Assemblies into the Two Long Bearings or Supports that are Provided for the Link Pin

★

ends of two short bearings are spot-drilled while 1.600-inch diameter drills cut one-quarter of the way through the long bearings—a distance of about 1 1/8 inches. In the second working station, 1 3/32-inch diameter drills are applied to drill through the same two bearings while 1.609-inch diameter drills cut through another one-quarter of the length of the long bearings.

In the third working station, the central one of the three short bearings is drilled half way through by a 1.087-inch drill on the right-hand head. Since a somewhat larger size drill was used for drilling the outer bearing through which the 1.087-inch drill must pass, there is sufficient clearance for this smaller diameter tool. At the same time, the long bearings are drilled another one-quarter of the way through by 1.617-inch diameter tools. In the fourth working station, the central small bearing is drilled through from the left-hand side, also by a 1.087-inch drill, while the long bearings are now drilled completely through by 1.625-inch drills on each head.

Finally, in the fifth working station the holes in the long bearings are reamed with tools on both heads of the machine while the holes in the short bearings are line-reamed with a tool on the right-hand head. The complete operation of this machine is hydraulically controlled, with the exception of indexing of the work carriage, which is accomplished manually. Hydraulic heads on top of the machine accelerate the feed of the reaming spindles.

The next important operation consists of broaching clearance along the web that extends between the three short bearings, and also rough-broaching the six ends of these bearings. Duplicate broaches are provided on the two slides of the machine, which is illustrated in Fig. 12. For this operation, the track links are located by entering sliding pins endwise into the reamed holes of the two large bearings. The

Fig. 17. Assembling Track Links Together by Pushing the Link Pin into Place Horizontally and Placing the Lock-key, Washer, and Nut in Position by Hand

★

Fig. 18. As the Sections of the Track Slide from the Machine in Fig. 17, the Lock-nuts are First Drawn Tight with a Portable Pneumatic Tool, and Then a Torque Wrench is Applied to Insure the Desired Tension on the Nut and Lock-pin

links are positioned endwise by inserting the high guide lug into a suitable opening in the fixture. A sliding clamp is then advanced over the central section of the track link to bring the short bearings firmly down on supports.

The next operation consists of finish-broaching the six ends of the small bearings by means of broaches on the left-hand slide of the machine in Fig. 13, and broaching the four ends of the two long bearings with tools mounted on the right-hand slide. The work fixtures of this machine are similar to those used in the first broaching operation, except for the second station, in which the finished face of one of the short bearings is used as an endwise locating point and pilot pins are inserted in the holes of the two outer small bearings.

Another important operation on the track links consists of drilling the clean-out hole, seen in Fig. 3, through each side of the central arm until one continuous hole is obtained. This 7/16-inch diameter hole is drilled for a length of 5/16 inch from each end, one drill being withdrawn from the hole just before the opposite drill breaks through the remaining material in the middle. Long drills are necessary in order to reach the portion of the forging being drilled. New drills 11 inches in length are specified, and they are used down to a length of approximately 7 inches. The fixture is equipped with bushings close to the point of operation to insure true rotation of the drill ends. (See Fig. 14.)

A six-station vertical machine, tooled up as shown in Fig. 15, drills the lock-pin hole. In the first three working stations are drills 19/32 inch in diameter. Each drills the hole one-third of the way through, the total length of the hole being 2 1/16 inches. In the fourth working station, the hole is finished by a reamer mounted on a spindle, the feed of which is accelerated by a special mechanism. The top of the hole is counterbored in the fifth working station.

For the operations performed in this machine, each link is located in a fixture by inserting two pilot pins horizontally into the holes of the large bearings and another pilot pin into the hole of the central short bearing. The links are seated at an angle of 30 degrees, so that the lock-pin hole can be drilled and reamed in vertical positions.

After several other minor operations, the track links reach the machine illustrated in Fig. 16, where a bushing, such as seen in Fig. 1, is assembled into each of the two long bearings. These bushings consist of a steel tube with three rings of rubber vulcanized to it. A bead, which forms a key for locating purposes in the several assembly operations, extends the length of the tube along the inside. When the bushings are mounted on the two arbors of the machine, this key is placed over a corresponding groove on both arbors.

The track link is properly lined up for the operation by inserting locating plugs in the two outer bearings and hollow centers in the holes of the large bearings. When the bushings are pushed into the track link, these hollow centers compress the rubber rings slightly and thus assist in their assembly. After the bushings have been assembled, a small plug is inserted in the end of each arbor and the arbors are then successively advanced to push back for a distance of about 1/8 inch, the opposite bushing to the one which the respective arbors assembled.

In this way, the stresses on the rubber rings are equalized.

The next operation consists of assembling the links together to form a track section. This is performed with the hydraulic machine illustrated in Fig. 17, which pushes the track link pins into place. The operator inserts the lock-pins, washers, and nuts by hand.

From Fig. 1 it will be seen that the track link pin has a flat surface that must be positioned in the track links in such a manner that it will mate with a cam-like surface on the lock key. To insure correct assembly, the track pin is provided with a groove to register with the bead in the bushings. This groove is lined up with the bushing key by a similar key in a bushing of the assembly fixture through which the track link pin must pass.

After each track link pin has been assembled and the arbor withdrawn, an automatic mechanism advances the length of the assembled links through a distance of one link. The practice here is to assemble track in lengths of ten links.

The final operation in this department before transferring the track link assemblies to the tank destroyer or tank assembly lines is to drive the lock-pin nuts tight. The threaded ends of the lock-pins are first pulled up tight into the nuts by applying a nut-setter attached to a portable pneumatic drill. Then a torque wrench is applied, as shown in Fig. 18, to make sure that the nut has been tightened with a force of 120 pounds. As the nut is revolved, the lock-pin is drawn up and its cam surface is tightly seated on the mating flat of the track link pin. The ten-link sections of track are assembled into full tracks of eighty-three links along the tank assembly lines, a typical view of which is shown in the heading illustration.

Research on Ball and Roller Bearing Lubrication

By A. F. BREWER, Technical and Research Division
The Texas Co., New York, N. Y.

A GREAT amount of research has recently been undertaken in the field of lubrication, especially with regard to the lubrication of ball and roller bearings. The military requirements of recent years have led to better coordination between the ball and roller bearing and the petroleum industries than ever before.

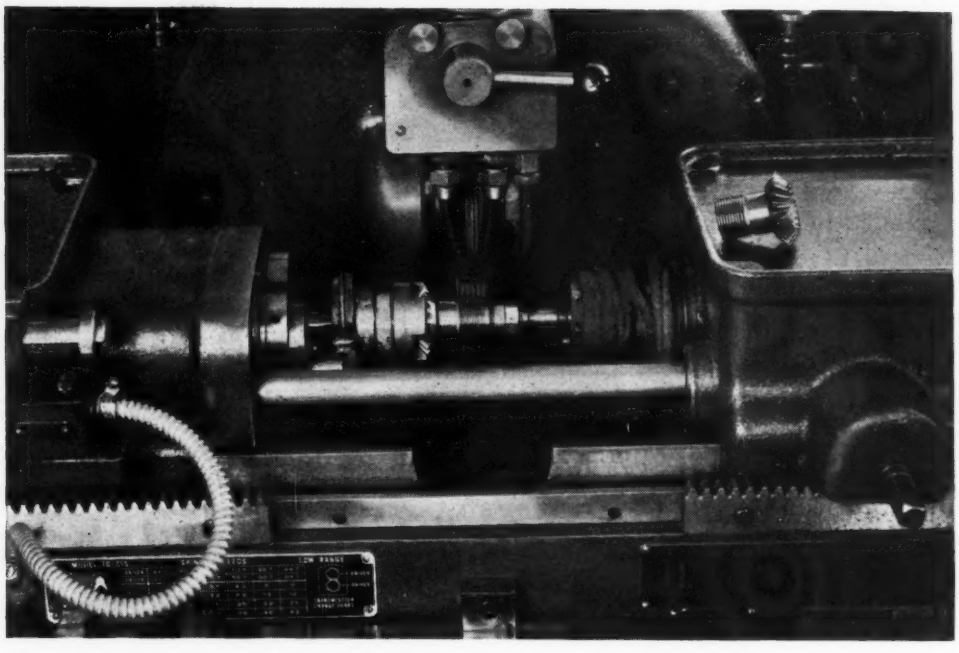
To be sure, with the organization of the Annular Bearing Engineers Committee and the National Lubricating Grease Institute, laboratory activities were expanded several years before the war and new lubrication products were developed; but it took the war emergency to fully drive home the fact that there was still much to be learned about bearing lubrication. Stratosphere flying at temperatures below minus 60 degrees F. proved that conventional ball-bearing greases were unsatisfactory for such service. Special greases had to be developed that would work efficiently at these temperatures, because if there were not free rolling of the bearing elements, proper control of the plane could not be maintained.

After the bearing specialist had done his part in providing a precision bearing, the petroleum chemist studied the low-temperature characteristics of available fats and mineral oils, and perfected methods of compounding in order to retain or improve these characteristics; then, in conjunction with the research workers of the ball and roller bearing industries, methods of testing were developed that were comparable with the actual service conditions as to temperature, speed, and exposure to moisture.

The resistance to oxidation and rust prevention qualities of the lubricant were also studied. Obviously, it is of little value for a grease to be able to function at from minus 40 degrees F. to plus 250 degrees F., meeting all prescribed physical tests, if it is susceptible to rapid oxidation. The resulting gums and lacquers would soon interfere with the free rolling of the bearing parts. Hence, the petroleum chemist looked around for oxidation inhibiters, of which a wide variety are available. It remained, however, to segregate these and select the correct combinations with lubricating oils and greases that would meet the service conditions in the field. Research also has been actively conducted in developing greases that will satisfactorily resist salt water rust. Such greases are valuable for protecting the ball bearings of naval aircraft.

Basic Methods of

A Review of the Principles Involved in Present Thread Grinding Practice with Single-Edge and Multi-Edge Wheels



Grinding Twelve Threads per Inch, Class 3 Fit, on a Pinion Hub on a Jones & Lamson Automatic Thread Grinder Using a Multi-ribbed Wheel with Alternate Ribs, the Work Revolving Approximately Two and One-half Times

THREAD grinding today is employed not only in precision tool and gage work, but also in production work for many classes of threaded parts. Thread grinding may be utilized because of (1) the accuracy and finish obtained; (2) the hardness of the material to be threaded; and (3) the economy effected in grinding certain classes of screw threads by the use of modern machines, wheels, and thread grinding oils.

In some cases, threads previously cut are finished by grinding; but to a large extent threads are also ground "from the solid," being formed entirely by the grinding process. Examples of work on which the threads are ground include thread gages and taps of steel and tungsten carbide, hobs, worms, lead-screws, adjusting or traversing screws, alloy steel studs, and many other parts. Grinding is applied to external and internal threads, to straight and taper threads, and to all the different thread forms.

Two important factors have been responsible for the rapid advance of thread grinding. These are the improved grinding wheels now available and the oils used as coolants. Means for keeping the oil clean, and in some instances, artificial means for controlling the temperature of the oil, have also been contributing factors.

When thread grinding was first introduced, it was thought that it was applicable only for the grinding of precision screws, taps, and gages, where the accuracy required made grinding essential, since the threads could be ground after hardening. However, with the development of machines, wheels, and cooling coils, it was soon found profitable to grind threads in soft materials and in cases where extreme accuracy was not required, as the cost of thread grinding compares favorably with some of the other methods of producing threads, when all cost factors are considered.

The degree of accuracy obtainable by thread grinding is very great. With single-edge or single-ribbed wheels it is possible to grind threads on gages to a degree of accuracy that requires but very little lapping to produce a so-called "master" thread gage. As far as lead is concerned, some thread grinding machine man-

Thread Grinding

By W. J. GRIMM, Manager, Thread Tool Division
Jones & Lamson Machine Co., Springfield, Vt.

ufacturers guarantee to hold the lead within 0.0001 inch per inch of thread; and while it is not guaranteed that a higher degree of accuracy for lead is obtainable, it is known that threads have been ground to much closer tolerances than this on the lead.

Pitch diameter accuracies for either Class 3 or Class 4 fits are obtainable according to the grinding method used; with single-edge wheels, the thread angle can be ground to an accuracy of within two or three minutes in half the angle. During the early war period, when there was a great shortage of thread gages, many concerns ground thread gages to the finished size without subsequent lapping. Some of the older concerns in the gage business did not approve of this practice, but apparently the gages were found satisfactory for the purpose for which they were required.

Wheels Used for Thread Grinding

The wheels used for grinding threads in steel are made from an aluminous abrasive, ordinarily with either a resinoid or a vitrified bond. The general rule is to use resinoid wheels when extreme tolerances are not required and it is desirable to form the thread with a minimum number of passes, as in grinding threaded machine parts such as studs, adjusting screws that do not require the highest degree of accuracy, and some classes of taps. Resinoid wheels, as a rule, will hold a fine edge longer than vitrified wheels, but are more flexible, and consequently not as suitable as vitrified wheels for highly accurate work in thread grinding, especially when there is lateral grinding pressure that causes wheel deflection.

Vitrified wheels are used for obtaining extreme accuracy in thread form and lead, because they are very rigid and not easily deflected by side pressure in grinding. This rigidity is especially important in grinding threads that have previously been cut by other means, as in the case of gages, taps, worms, and lead-screws. The progressive lead errors in long cut lead-screws, for example, might cause an increasing lateral pressure in grinding that would deflect a resinoid wheel. Vitrified wheels are also recommended for internal grinding.

Diamond wheels set in a rubber or plastic bond are also used for thread grinding, especially for grinding threads in carbide materials and in other hardened alloys. Thread grinding is now being successfully done on a commercial basis on both taps and gages made from carbides. Gear hobs made from carbides have been tested with successful results and further developments and research are being carried on at this time. Diamond wheels are dressed by means of silicon-carbide grinding wheels which travel past the diamond-wheel thread form at the required angle of the flanks of the thread to be ground. The action of the dressing wheels is, perhaps, best described as a "scrubbing" of the bond which holds the diamond grits. Obviously, the silicon-carbide wheels do not dress the diamonds, but they loosen the bond until the diamonds not wanted drop out.

Wheel Hardness or Grade of Grinding Wheels

The selection of wheel hardness or grade is based on a compromise between efficient cutting and durability of the grinding edge. The grade selection depends on the bond and the character of the work. The following general recommendations are based on the grading used by the Norton Co. Vitrified wheels for thread grinding usually range from J to M, and resinoid wheels from R to U.

For hardened or heat-treated screws or studs with American Standard thread, the following grades are recommended: For 8 to 12 threads per inch, Grade S resinoid wheel; for 14 to 20 threads per inch, Grade T resinoid; for 24 threads per inch and finer, Grades T or U resinoid. For high-speed steel taps, the recommendations are: For 4 to 12 threads per inch, Grade J vitrified or S resinoid; for 14 to 20 threads per inch, Grade K vitrified or T resinoid; for 24 to 36 threads per inch, Grade M vitrified or T resinoid.

The Selection of Grain Size for Thread Grinding

A thread grinding wheel usually operates close to its maximum stock removing capacity, and the narrow edge which forms the root of the thread is the most vulnerable part. In grain selection, the general rule is to use the coarsest

grain wheel that will hold its form while grinding a reasonable amount of work. The most important governing factors are the pitch of the thread and the quality of the finish. Thus to obtain an exceptionally fine finish, the grain size might be smaller than is needed to retain the edge profile.

For hardened or heat-treated screws and studs with American Standard threads, the usual range is from 100 to 180. For precision screw threads of very fine pitch, the grain size may range from 220 to 320. For high-speed steel taps, the usual range is from 100 to 180 for American Standard threads, and from 80 to 150 for pre-cut Acme threads.

Thread Grinding with Single-Edge Wheel

The single-edge or single-ribbed wheel is trued to the cross-sectional shape of the thread groove. In other words, it has the form of a single thread of the form to be ground. When new, the wheel may have a diameter of 18 or 20 inches, and in grinding a thread, it is inclined so that the thread form on the wheel is aligned with the helix of the thread groove to be ground. On some thread grinding machines lead variations are obtained by means of change-gears, which transmit motion from the work-driving spindle to the lead-screw. Other machines are so designed that a lead-screw is selected to suit the lead of the thread to be ground, transmitting motion directly to the work-driving spindle.

Except in cases of extreme accuracy, work with 12 threads per inch and finer is usually ground at a single pass of the wheel. This rule, however, may have to be modified in certain instances. For example, a work diameter as large as 4 or 5 inches may be provided with 12 threads per inch. In making a decision as to whether a thread should be ground in one or more passes, it is necessary to take into consideration the "unwrapped thread length," which is obtained by multiplying the pitch diameter by 3.1416, and multiplying this product by the number of threads in the total length to be threaded.

For example, a thread gage 1 1/4 inches long with 24 threads per inch would have an unwrapped thread length thirty times the circumference of the pitch diameter. For convenience in calculations, the outside diameter may be used instead of the pitch diameter in this computation. The unwrapped length of thread is often the governing factor in selecting the number of passes required, but the accuracy called for is also a factor. For example, in a screw of Class 3 fit, having 12 threads per inch, 6 or 7 feet of unwrapped thread is readily obtainable in one pass of the wheel, whereas if a Class 4 fit were required, two passes would be recommended.

Fig. 1. Diagram Showing the Use of a Three-ribbed Wheel with a Thread Topping Rib for Grinding Threads that are Too Long to be Handled with the Ordinary Multi-ribbed Wheel

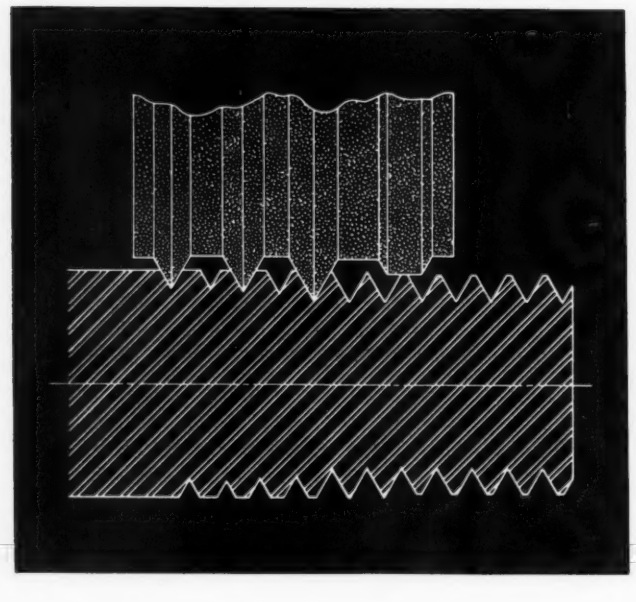
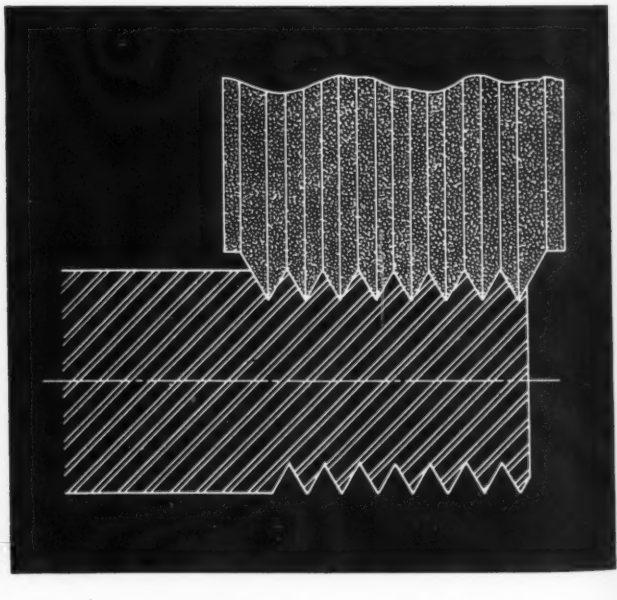


Fig. 2. Multi-ribbed Wheel Used for Thread Grinding. The Complete Thread is Ground in One Revolution of the Work Plus about One-half Revolution for Feeding in and Withdrawing Wheel



When two passes of the grinding wheel are required, too deep a roughing cut may break down the narrow edge of the wheel. To prevent this, it is better to use a roughing cut equal to about two-thirds of the total depth of the thread, thus leaving about one-third of the thread depth for the finishing cut.

Wheels with Separate Ribs or Edges for Roughing and Finishing

The so-called "three-ribbed" type of thread grinding wheel has a roughing edge or rib, which removes about two-thirds of the metal. This is followed by an intermediate rib, which leaves about 0.005 inch for the third or finishing rib. The accuracy obtained with this triple-edge type of wheel compares with that of a single-edge wheel, which means that it may be used for the greatest accuracy obtainable in thread grinding. When the accuracy required makes it necessary, this wheel can be inclined to the helix angle of the thread, the same as is the single-edge wheel. It is expected that this type of wheel will acquire a prominent place in future thread grinding practice.

The "three-ribbed" wheel is recommended not only for precision work, but for grinding threads that are too long for the "multi-ribbed" wheel, to be referred to later. It is also well adapted to tap grinding, because it is possible to dress a portion of the wheel adjacent to the finish rib for the purpose of grinding the outside diameter of the thread, as indicated in Fig. 1. Furthermore, the wheel can be dressed for grinding or relieving both crests and flanks at the same time.

"Multi-Ribbed" Wheels for Thread Grinding

Thread grinding wheels are also made from 1 1/4 to 2 inches wide with a series of annular thread-shaped ridges formed on their face. (See Fig. 2.) Hence the name "multi-ribbed" wheel. The length of the thread and the width of the wheel are usually equal. That being the case, a thread can be ground in one work revolution plus about one-half revolution for feeding in and withdrawing the wheel. The principle of operation, in fact, is the same as that of thread milling with a multiple type cutter. Since this type of wheel is not inclined to the lead angle, to obtain a Class 3 fit the lead angle should not exceed 4 degrees. This type of wheel is employed when rapid production is more important than extreme accuracy, which means that it is intended primarily for the grinding of duplicate parts in manufacturing. It is not practicable, however, to use this form of wheel on thread pitches where the root is less than 0.007 inch wide, because of difficulties in wheel dressing.

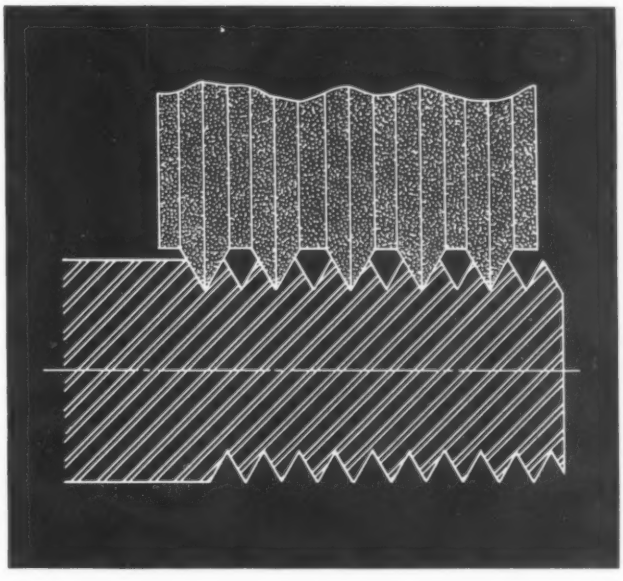


Fig. 3. Multi-ribbed Wheel with Every Other Annular Rib Removed. About Two and One-half Work Revolutions are Required for Grinding a Complete Thread

When this method can be applied, it is the fastest means known of producing threads in hardened materials. It is not recommended, however, that thread gages, taps, and work of this character be ground with multi-ribbed wheels. The single-ribbed wheel has a definite field for accurate, small-lot production.

It is necessary, in multi-ribbed grinding, to use more horsepower than is required for single-ribbed wheel grinding. Coarse threads, in particular, may require a wheel motor with two or three times more horsepower than would be necessary for single-ribbed grinding.

In another method of thread grinding, the wheel is so dressed that every other annular rib in the wheel is removed, the ribs being so spaced as to grind every other thread during the first revolution of the work and complete the thread during the second revolution. (See Fig. 3.) Consequently, about two and a half work revolutions are required for grinding a complete thread; however, the better distribution of cooling oil, with resulting increase in work speeds, makes this wheel very efficient.

This alternate-type of wheel is adapted for grinding threads of fine pitch. Since these wheels cannot be tipped to the helix angle of the thread,

they are not recommended for anything closer than Class 3 fits. The "three-ribbed" wheels referred to in a previous paragraph are also made in the alternate type for the finer pitches.

Grinding Threads "From the Solid"

The process of forming threads entirely by grinding without preliminary thread cutting is applied both in the manufacture of certain classes of threaded parts and in the production of precision tools, such as taps and thread gages. For example, in airplane engine manufacture, certain parts are heat-treated and the threads are then ground from the solid, thus eliminating distortion, as well as the minute cracks often found at the roots of threads that have been cut and then hardened.

Threads of coarse pitch in steel may be rough threaded by cutting, then hardened, and finally corrected by grinding. Many ground-thread taps, however, are produced by grinding from the solid after hardening. By hardening high-speed steel taps before the thread is formed, there are no narrow or delicate crests to be injured by the high temperature required in hardening high-speed steel.

When, on a threaded piece of work, the side on which the threads are being ground is moving upward or against the grinding wheel rotation, less heat is generated and the grinding operation is more efficient than when wheel and work are moving in the same direction on the grinding side. However, to avoid running a machine idle during this return stroke, many screw threads are ground during both the forward and return traversing movements by reversing the work rotation at the end of the forward stroke. For this reason, thread grinders are generally equipped so that both forward and return work speeds can be changed; they may also be designed to accelerate the return movement when grinding in one direction only.

Wheel Speeds for Thread Grinding

Wheel speeds should always be limited to the maximum specified on the wheel by the manufacturer. According to the American Standard Safety Code, resinoid wheels are limited to 9500 and vitrified wheels to 6500 surface feet per minute. One grinding wheel manufacturer, however, states that the most efficient speeds for the wheels made by him are from 9000 to 10,500 for resinoid wheels, and from 7500 to 9500 for vitrified wheels. Only tested wheels recommended by the wheel manufacturer should be used. After a suitable surface speed has been established, it should be maintained by increasing the revolutions per minute of the wheel as the latter is reduced in diameter by wear.

Since thread grinding wheels work close to the limit of their stock removing capacity, some adjustment of the wheel or work speed may be required to obtain the best results. If the wheel speed is too slow for a given job and excessive heat is generated, try an increase in speed within the safety limits. If the wheel is too soft and the edge wears excessively, an increase in wheel speed will give the effect of a harder wheel and result in better form-retaining qualities.

Work Speeds for Thread Grinding

The work speed usually ranges from 3 to 10 feet per minute. In grinding with a comparatively heavy feed and a minimum number of passes, the speed may not exceed 2 1/2 to 3 feet per minute. If very light feeds are employed, as in grinding hardened high-speed steel, the work speed may be much higher than 3 feet per minute, and should be determined by tests. If excessive heat is generated by removing stock too rapidly, a work speed reduction is one remedy. If a wheel is working below its normal capacity, an increase in work speed would prevent dulling of the grains and reduce the tendency to heat or burn the work. An increase in work speed and reduction in feed may also be employed to prevent burning when hardened steel is being ground.

Truing of Grinding Wheels

Thread grinding wheels are trued both to maintain the required thread form and also to produce an efficient grinding surface. Thread grinders ordinarily are equipped with precision truing devices that function automatically. One type automatically dresses the wheel and also compensates for the slight amount removed in dressing, thus maintaining size control of the thread to be ground. While truing the wheel, a small amount of grinding oil should be used to reduce the wear of the diamond. Light truing cuts are advisable, especially in truing resinoid wheels, which may be deflected by excessive truing pressure.

A master former for controlling the path followed by the truing diamond may require a modified profile to prevent distortion of the thread form, especially when the lead angles are comparatively large. Such modification usually is not required for 60-degree threads when the

pitches for a given diameter are standard, because the lead angles in that case are less than 4 1/2 degrees. In grinding Acme threads or 29-degree worm threads having lead angles greater than 4 or 5 degrees, however, modified formers may be required to prevent a bulge in the thread profile. The highest point of this bulge is approximately at the pitch line. A bulge of about 0.001 inch may be within the allowable limits on some commercial worms, but precision worms for gear-hobbers and similar equipment require straight flanks in the axial plane. To insure this, modified formers are required.

Thread grinding wheels are also dressed or formed by the crushing method, which is used in connection with some types of thread grinding machines. When this method is used, the annular ridge or ridges on the wheel are formed by a hardened steel cylindrical dresser or crusher. The crusher has a series of smooth annular ridges which are shaped and spaced like the thread that is to be ground. During the wheel dressing operation, the crusher is positively driven instead of the grinding wheel, and the ridges on the wheel face are formed by the rotating crusher being forced inward.

* * *

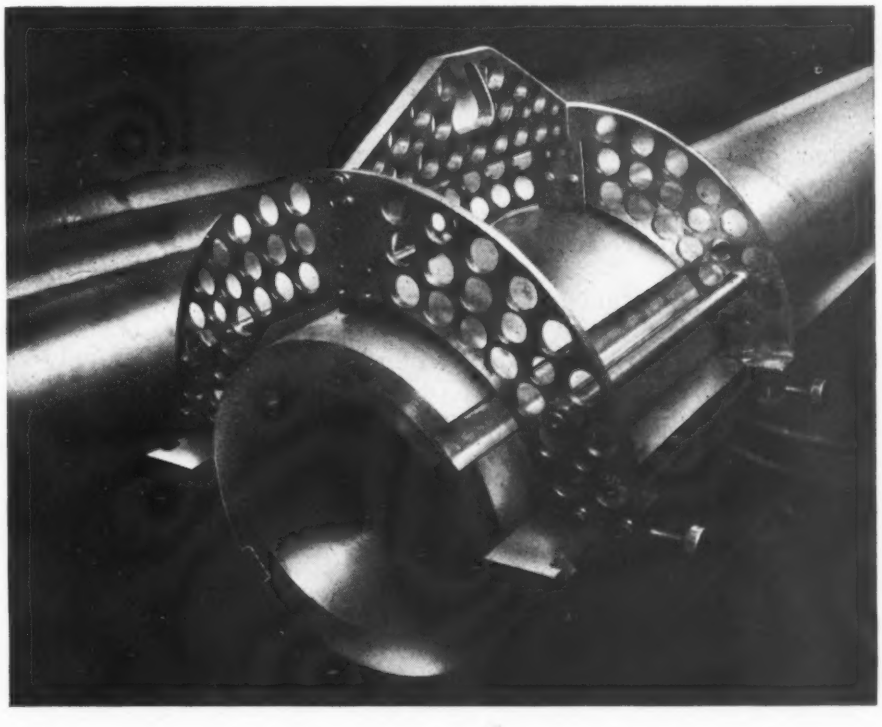
Gage for Large Tapered Shafts

The taper gage shown in the accompanying illustration was developed at the Puget Sound Navy Yard by William L. Smith. The construction will be understood by an inspection of the illustration. Within certain limits, the gage is adjustable to various diameters.

The blades that are in contact with the work are 2 feet long and machined so that when the taper on the inside is set to measure a taper of 1 inch to the foot, the two outside edges of the blades will be parallel. Since over 90 per cent of all the shafts handled at the Navy Yard have a 1-inch taper per foot, this method of making the blades provides an easy means of checking the setting of the taper blades.

The gage is set to a hub templet or sample shaft, and is then placed directly on the shaft that is being turned or inspected. Thus, the checking is done entirely by comparison. Two men can place the gage on the large shaft without a crane.

A set of three of these gages accommodates all the shafts of this type handled at the Navy Yard. It is estimated that the use of this gage will make labor savings valued at approximately $3000 a year possible at the Navy Yard.



Adjustable Taper Gage for Large-diameter Shafts

* * *

Gear Manufacturers Hold Executive Meeting

Owing to the restriction on industrial meetings and conventions, the twenty-ninth annual meeting of the American Gear Manufacturers Association was limited to an attendance of fifty, in accordance with the request of the Government. The meeting was held May 21 and 22 at Hot Springs, Va., and was attended mainly by the officers, executive committee, and administrative committees. The president of the Association, Louis R. Botsai, addressed the meeting, referring briefly to present conditions in the industry and the problems it has to face. The administrative committees presented their reports, and the general engineering and commercial committees held their regular meetings.

At one of the sessions, Alfred J. Kroog, Lieutenant U. S. Naval Reserve, and Richard W. Righter, engineer with the Navy Department, presented a "Progress Report on Carbide Hobs for Cutting Marine Propulsion Gears," referred to on page 183 of this number of MACHINERY.

Selection of Cutting Fluids

Characteristics of Coolants and Cutting Fluids Generally Used in Industry, and Cutting Fluids Most Suitable for Different Materials

By JAMES R. CHAMBERS, Lubrication Engineer
Illinois Division, Bendix Aviation Corporation
Chicago, Ill.

THE recent progress in the development of economical methods of metal cutting must be attributed to several important factors. One of these factors that deserves much credit is the development of new types of coolants, cutting oils, and grinding fluids. In selecting the cutting fluid for a specific machining operation and material, a number of things must be considered—the kind of metal to be cut, the type of operation, the feeds and speeds used, and sometimes the type of machine on which the work is performed. Unfortunately, it is not possible to give rules that will cover all kinds of materials and operations under all conditions.

For example, the results obtained with a soluble oil in machining stainless steel may have been highly satisfactory, but in cutting the same kind of steel in a different, although similar, operation, the results may be far from good. Also, the type or design of the machine tool may affect the selection of the cutting fluid; for example, it may have been found that a soluble coolant on a milling operation gives good results, but on a machine equipped with a hydraulic unit located beneath the table, the coolant may penetrate into the hydraulic system, because of the design of the machine, and contaminate the hydraulic oil.

Purposes Served by Cutting Fluids

Briefly, cutting fluids or coolants are used: (1) To dissipate the heat generated by the cutting operation; (2) to eliminate friction between the tool and the metal being cut; (3) to provide a good finish on the part being machined; and (4) to wash away the chips.

In the case of carbide-tipped tools, the dissipation of the heat generated is important, not so much because the carbide tip requires cooling, as because excessive heat may have a tendency to affect the bond between the carbide tip and the shank. The danger of difficulties arising from this source may be eliminated by the selection of the right coolant.

In the selection of a coolant, its "safety" features should also be considered. The cutting fluid should have a relatively high flash point and should contain no constituents that would be likely to cause skin rash or dermatitis, nor should it have an objectionable odor.

Industrial coolants may be divided into the following main classifications—soluble oils, base oils, and mineral oils.

Soluble Oils Used as Cutting Fluids

The term "soluble oils" includes all types of solids and liquids that form emulsions when mixed with water. This particular type of cutting fluid is well suited for operations that require great cooling or wetting qualities in the low-temperature ranges. Practically all the commercial types are suitable for regular metal-cutting operations, but care should be taken in selecting the proper soluble oil for precision grinding operations. Grinding coolants should be free from fatty materials that tend to load the wheel, thus affecting the finish on the machined part.

The soluble coolants should also contain rust preventive constituents to prevent corrosion. They range in color from transparent to milky whiteness. The only type of metal for which they are not suitable is magnesium, a subject that will be discussed later.

Base Oils Used in Cutting Metals

The term "base oils" includes the various types of highly sulphurized and chlorinated oils that contain inorganic, animal, or fatty materials such as lard oil, synthetic materials, wool grease, sperm oil, etc. Base oils usually have a viscosity range of from 300 to 900 seconds at 100 degrees F. They are generally used as a base stock which is cut back with a lighter oil. For many machining purposes, sulphurized or chlorinated compounds facilitate machining. In some operations, such as heavy broaching on steel, the base stock is used straight, without blending with lighter oils, because the high viscosity rate produces a cushioning effect and lessens the chip bearing pressure.

Base oils are generally used for machining both ferrous and non-ferrous metals. A high percentage of sulphur compounds sometimes has a tendency to discolor the machined pieces. Cut back with lighter mineral oils, base oils are often used in automatics in preference to aqueous solutions. The lubrication supplied to movable machine parts by the coolant itself will be found useful.

Base oils are usually dark in color. As a rule, they contain sulphur compounds resulting from a thermal or catalytic refinery process. When so processed, they are more suitable for industrial coolants than when they have had such compounds as flowers of sulphur added by hand. The adding of sulphur compounds by hand to the coolant reservoir is of temporary value only, and the non-uniformity of the solution may affect the machining operation. The unstable solution may be attributed to the action of various hydrocarbons under normal conditions.

Mineral Oils Used for Machining Processes

The term "mineral oils" is applied to all types of oils extracted from petroleum. It includes paraffin oil, mineral seal oil, and kerosene. These oils are generally employed as coolants in their original form without being cut back with additives. On light machining operations, where the stock removal is not too great, this type of oil is successfully used, and it has proved satisfactory both on free-machining steels and non-ferrous metals.

The coolants in this class should be of a type that has a relatively high flash point. Care should be taken to see that they are non-toxic, so that they will not be injurious to the operator. The heavier mineral oils (paraffin oils) usually have a viscosity of about 100 seconds at 100 degrees F. Mineral seal oil and kerosene have a viscosity of 35 to 60 seconds at 100 degrees F.

These oils are often blended with heavy base stocks. In this manner, the proper percentage of sulphurization or chlorination may be obtained for any specific machining operation.

Generally speaking, cutting speeds are directly related to and controlled by the cutting fluids. Actual tests have shown that the use of a water soluble permits an increase in cutting speeds over dry cutting of as much as 40 per cent. The use of oils has permitted an increase of as much as 20 per cent in cutting speeds, compared with dry cutting.

Cutting Lubricants for Steel and Cast Iron

All types of steel—high- and low-carbon, and free-cutting—may be machined with almost any type of coolant, such as soluble oils, mineral oils, and sulphurized or chlorinated base oils. When there is not too much stock to be removed, good results are obtained with soluble solutions. For heavy cuts on nickel, vanadium, or chromium steels, which produce a high chip bearing pressure on the tool, a heavy sulphurized base oil may be employed. In broaching, a base stock is generally used. For operations that do not require a heavy base oil or the maximum sulphurization, a cut-back of base oil with mineral oil will give the proper viscosity to the compound.

As is well known, cast iron is usually machined dry, but soluble oil or a low viscosity mineral oil may be used as a cutting fluid to prevent excessive metal dust.

Cutting Compounds for Brass

While brass is usually machined dry, most machining operations can be performed successfully with a water soluble or straight mineral oil. An addition of 10 per cent lard oil to mineral oil is often used. In isolated cases, it may be necessary to use a heavy sulphurized base oil when broaching brass parts. The oxidizing effect of the cutting fluid on brass can be eliminated by immediately washing or flushing the work-piece after machining.

In some types of brass and phosphor-bronze, machining difficulties have largely been overcome by the addition of lead in the brass or bronze alloy.

Machining Aluminum Alloys

In machining aluminum, several varieties of coolants may be used. For rough machining, where the stock removal is sufficient to produce heat, water soluble mixtures can be used with good results to dissipate the heat. Other oils that may be recommended are straight mineral seal oil; a 50-50 mixture of mineral seal oil and kerosene; a mixture of 10 per cent lard oil with 90 per cent kerosene; and a 100-second mineral oil cut back with mineral seal oil or kerosene.

At low speeds the tendency for ductile metals like aluminum to tear or shear is attributed to the "built-up" edge of the cutting tool. At high speeds, this tendency to "build up" is not so pronounced. Owing to the ductile characteristics of aluminum alloys, some operations may require a coolant of an entirely different character from those mentioned.

Generally speaking, sulphurized oils are not recommended for cutting aluminum. This is due in part to the chemical reaction on the aluminum alloy, resulting in discoloration of the metal. In some tapping operations, however, the results obtained with sulphurized oil have been highly satisfactory. In that case, the machined parts were slushed immediately in a solvent slushing tank to prevent discoloration. If

sulphurized oil is used for aluminum, measures should always be taken for washing the finished piece immediately after machining, to prevent it from being discolored.

Cutting Fluids for Magnesium Alloys

For machining magnesium alloys, mineral oils and compounds of mineral oils are used. Water solubles and emulsions are not recommended. The inflammability of magnesium chips or particles makes it necessary to dissipate the heat generated by the machining operation. This is especially the case in milling or grinding magnesium alloys. When we recognize the fact that the boiling point of magnesium is only 1107 degrees C., we realize that the heat generated from the cutting operation, unless properly dissipated, may produce a vapor from the metal which is highly inflammable.

There are three important points to be considered in the machining of magnesium: (1) Employ sharp tools; (2) use an ample volume of the right kind of coolant; and (3) clear away surplus chips from the machine at all times.

The coolants recommended for machining magnesium are: (1) Straight mineral seal oil with a minimum flash point of 265 degrees F.; (2) straight mineral oil, 50 to 100 seconds viscosity at 100 degrees F.; (3) a mixture of 20 per cent 100-second mineral oil with 80 per cent mineral seal oil; (4) a mixture of 10 per cent fatty materials with 90 per cent mineral seal oil; and (5) a mixture of 10 per cent fatty materials with 90 per cent 100-second mineral oil. All oils used in machining magnesium should be anhydrous and non-acid in character.

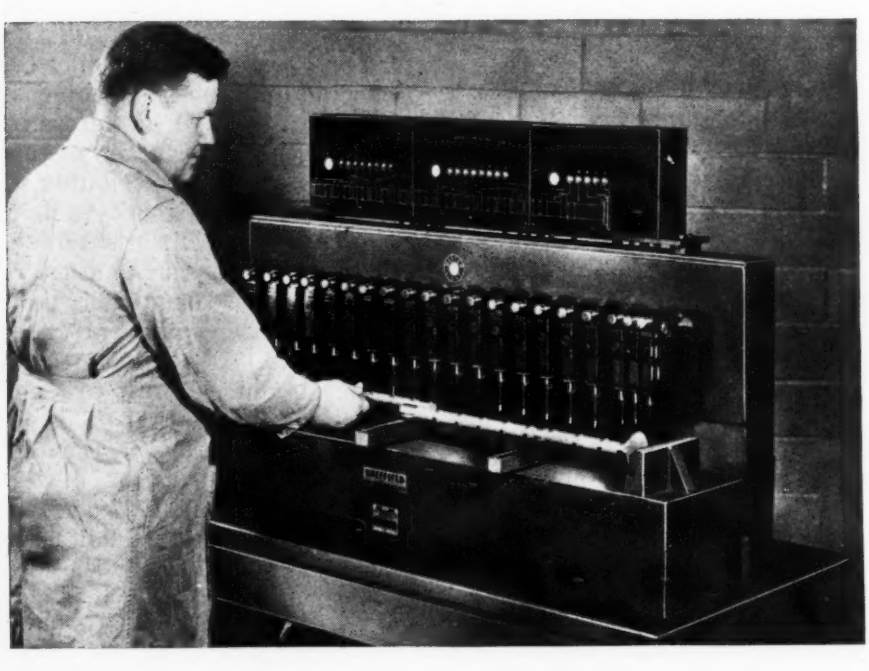
A tabulated arrangement of recommended coolants for metal-cutting operations will be found in the Data Sheets (page 225) of this number of MACHINERY.

* * *

Motion Picture on Expansion and Contraction in Welding

Realizing that the most effective use of arc welding requires a knowledge of how metals expand and contract when heated and cooled, the Lincoln Electric Co. has produced a color and sound motion picture designed to thoroughly explain this subject. The picture also indicates how distortion, due to expansion and contraction, can be prevented and controlled. The picture—a Walt Disney production—clearly brings out the fact that distortion can generally be prevented by the application of three simple rules as follows: (1) Reduce the effective shrinkage force; (2) make shrinkage forces act to minimize distortion; and (3) balance the shrinkage forces with other forces. In each case, the picture shows exactly how the objectives indicated by these rules can be attained, detailed directions being given. Even experienced engineers will find this treatment of the subject helpful and instructive.

This 16-millimeter film, which is entitled "Prevention and Control of Distortion in Arc Welding," can be obtained by schools, colleges, technical societies, factories, and other industrial groups by application to the Lincoln Electric Co., 12818 Coit Road, Cleveland 1, Ohio. The running time of the film is twenty minutes.



Sheffield Multicheck Gage Used for Accurate and Rapid Checking of Twenty-one Diameters of Camshafts. All the Dimensions are Checked Simultaneously in One Operation. The Lights on the Panel Remain off when the Dimension Checked is within the Tolerance Limits. The Light Bulb Shows Red when the Dimension is below the Permissible Limits, and Green when It is above. One Master Light Remains off when All the Dimensions are within the Limits. If One or More Dimensions are Incorrect, the Master Light Goes on, and the Operator then Takes Note of the Red and Green Lights Indicating the Error

Electronic Measurement, Analysis, and Inspection—1

By HOLBROOK L. HORTON

Fifth of a Series of Articles on the Fundamentals of Electronics and the Ways in which Electronic Devices can be Applied in the Mechanical Field

In three previous articles of this series the use of electronic devices for motor control, resistance-welding control, and induction and dielectric heating—three industrial applications of major importance—was discussed in some detail. There are, of course, many other industrial applications in which electronic devices perform an important function. Perhaps a majority of the remaining applications that are of interest in the mechanical field may be grouped under the heading of measurement, analysis, and inspection equipment.

Function of the Photo-Tube

The first of the electronic devices to be discussed under this heading is the photo-tube, popularly known as the "electric eye." Outside of the radio vacuum tube and the X-ray tube, it is probably the best known of any electronic device, and is now well established in a great variety of applications for the controlling and regulating of production machinery and the counting and sorting of parts and products in process of manufacture.

The principle of operation of the photo-electric control is extremely simple. Two basic units are required—a light-sensitive electronic tube, or photo-tube, and a light source, usually an incandescent lamp with a suitable reflector and focussing lens. The light source is located so that its beam of light is focussed on the photo-tube.

As pointed out in the first article of this series (May, 1944, MACHINERY, page 135), the photo-tube has two elements—a cathode, which is coated with a photo-sensitive substance, and an anode of a distinctive shape. When light falls on the cathode, electrons are emitted and passed to the anode, resulting in a flow of electric current through the photo-tube and around the electrical circuit in which it is connected. When this beam of light is interrupted so that it no longer falls on the cathode, the emission of electrons from the cathode stops and current ceases to flow in the photo-tube circuit. If an extremely sensitive relay is placed in this circuit, it will be actuated by the operation of the photo-tube, and thus various types of operations dependent upon the opening or closing of an electric circuit can be performed.

Usually an automobile headlight type of lamp

Fig. 1. Minute Quantities that Previously could Only be Indicated are Now Recorded by a High-speed Photo-electric Recorder. Vibration Displacements as Small as 0.0002 Inch can be Detected with This Instrument, which is Shown Recording the Vibrations of a Work-bench

that operates at 6 to 8 volts is employed as a light source. When it is desired that the light emitted for actuating the photo-tube be invisible, an infra-red filter is utilized. If the light source is to be located at a considerable distance from the photo-tube, so that a photo-tube of high sensitivity is required, the problem of preventing extraneous light, such as may be reflected by light-colored objects or polished surfaces, from actuating the photo-tube arises. To avoid this, a type of photo-tube amplifier circuit is used that responds only to a pulsating light within a given frequency range. This pulsating light can be obtained by means of a motor-driven slotted disk which interrupts the light beam at a given rate, say 540 times per second.

A typical photo-controlling unit consists of a photo-tube, an amplifying tube of a type similar to that used in radio sets, a sensitive relay with a current capacity of 1 to 2 amperes alternating current, and a transformer which provides current at the proper voltage for the relay circuits when alternating current is used. In place of a sensitive relay, another type of photo-controller utilizes a thyratron tube, which is a gas-filled three-element tube that functions as a lock-in relay. The thyratron tube may, in turn, operate a standard type of relay included in the photo-controller unit or it may operate an external load directly.

Photo-controllers are available operating up to 400 times a minute with light flashes of 1/15 second duration and intervals between flashes of at least 1/15 second. Others will operate with light impulses as short as 0.0001 second. These types of controllers are useful for counting and similar operations.

Sometimes it is desirable to have the operation of a relay resulting from a light impulse on a photo-tube take place after a certain time delay. Photo-controllers are available with special circuits that provide one to five seconds time delay before the relay in the control circuit is operated. This type of photo-controller is useful for such applications as indicating interference on a conveyor which persists beyond a certain preset time limit.

Typical Applications of Photo-Controllers

The wide variety of applications for which photo-controllers are suitable can only be indicated in a general way by the few types here described. The correct alignment of metal strips fed into a punch press can be assured by means of photo-electric control. A beam of light falling on an electronic tube is intercepted by a small round flag. Only when the strip of metal is in the correct position does a hole in the flag allow light to fall on the photo-tube, which then actuates the relay that controls the operation of the press. With this type of control, rejections caused by improper alignment can be entirely eliminated.

A high-speed photo-electric recorder, such as that shown in Fig. 1, will now record anything that can be measured. Quantities so minute that previously they could only be indicated can now be recorded swiftly and accurately. This device is being employed for the high-speed recording of such measurements as eccentricity of rotation, temperature, pressure, rate of flow, vibration, etc.

Photo-electric controllers are being used more and more in processing plants to govern the timing and order of a sequence of operations. Even weighing is done photo-electrically. A beam scale with a photo-electric unit insures that all material is weighed out in proper amount and injected into the process at correct intervals.

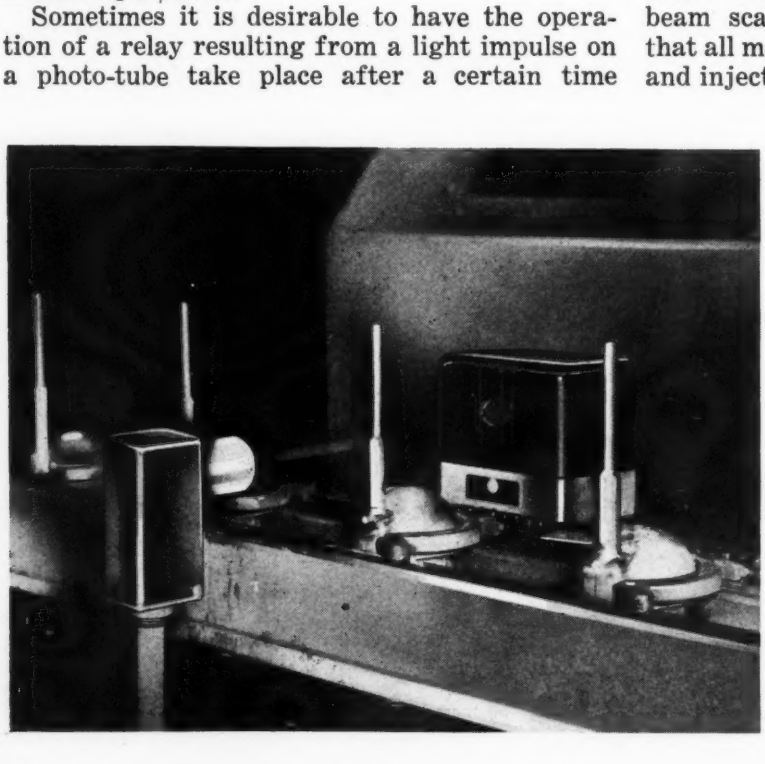


Fig. 2. A Relatively Simple Photo-electric Arrangement for Counting Valves as They Leave a Heat-treating Furnace. This Type of Relay is Widely Employed in Industry for Counting, Indicating, and Controlling Operations

In another, relatively simple, application, shown in Fig. 2, an inexpensive photo-electric relay is used to count parts as they leave a heat-treating furnace. This type of relay has a 10-ampere capacity for operating magnetic counters, solenoids, or magnetic switches.

Piston-rings are now being inspected photo-electrically. The ring to be inspected is placed inside a master ring of correct size. The two rings are revolved together while the clearance space between them is scanned by beams of light directed on photo-electric cells. If the periphery of the piston-ring being inspected is within certain tolerance limits, a green signal light is flashed at the end of one complete revolution. A red signal light indicates that the piston-ring is out-of-round beyond the acceptable limit. A yellow signal light indicates that the gap being measured is under size.

Photo-tubes are used extensively as pyrometers for the measurement of temperatures of hot bodies. The radiant energy emitted by the hot body bears a direct relationship to its temperature, and when it impinges on the cathode of the photo-tube, it causes an electric current to flow, as previously described. This current is amplified by a vacuum-tube amplifier, and is then used to operate a recording or indicating instrument. The principal feature of the photo-tube pyrometer is that it provides, without appreciable time lag, a continuous indication or record of the temperature of incandescent bodies. The high speed of response makes this type of pyrometer particularly valuable for measuring the temperature of successive pieces of material in process, such as bars or billets passing through a steel mill.

The photo-tube pyrometer has been applied to controlling the operation of making cast-iron pipe by the centrifugal sand spun process. The pyrometer is arranged to indicate the temperature on the inside of the pipe as it is being formed by the spinning of hot liquid metal. When the pipe is cooled beyond a certain point, the pyrometer actuates a relay causing the spinning motor to be stopped.

Another application is in a piercing mill, where steel billets are made into seamless steel tubes. Three furnaces supply the heated billets, and there is usually an appreciable difference in the temperatures of the billets from the respective furnaces. Installation of the photo-electric pyrometer reduced spoilage by prompt indication of billets that were at too high temperatures.

Another interesting application of the photo-tube is in the photo-electric spectro-photometer. This instrument provides an accurate and permanent graphical analysis of any color, permitting the control and standardization of manufacturing processes relating to the color of paints, dyes, glass, etc. It also is used for the

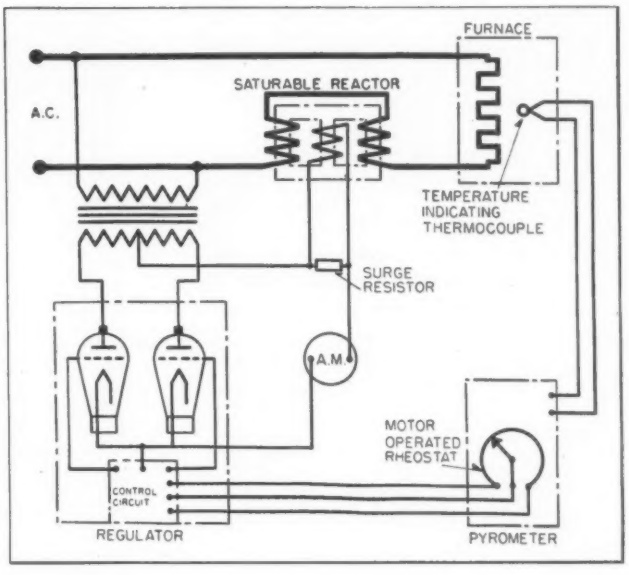


Fig. 3. Diagram Showing Main Elements of Electronic Temperature Regulator that Provides Continuous Adjustment. The Direct-current Output of the Rectifier Tubes Varies with the Thermo-couple Temperature. Variation of Direct Current Passing through Saturable Reactor Regulates Current Input to Furnace

accurate quantitative chemical analysis of colored solutions and suspensions of solids in solution. Extremely small quantities, such as one-hundredth of a millionth of a gram of silver or one-millionth of a gram of copper in 25 cubic centimeters of a solution can be accurately measured with this electronic instrument.

Other functions performed by photo-tubes include the opening and closing of doors for the passage of industrial trucks; the sorting and inspecting of small assemblies; the protection of operators of hazardous machines; the detection of pin-holes in tin plate; the automatic operation of valves and switches; the automatic control of simultaneous pouring operations in foundries; the regulation of gas or smoke density; the checking of liquid turbidity; the detection of change in liquid concentration; and the control of interfaces between two liquids or a liquid and a gas.

Electronic Temperature Regulation is Continuous and Accurate

Instead of "on" and "off" regulation, electronic tubes now make possible a continuous adjustment of power or heat supply to maintain temperature within exceedingly close limits. If the temperature being controlled is that of a furnace, a thermopile may be used to cause a current to flow in the control circuit. As the temperature varies, the current flow changes accordingly. This minute direct current produced by the thermopile unbalances a bridge circuit,

Fig. 4. Cathode-ray Equipment Used in Metallurgical Analysis and Inspection. Variations of Pattern Formed on a Cathode-ray Screen from a Given Reference Pattern Indicate Variations in Such Properties as Hardness, Plating Thickness, Carbon Content, etc.

which results in control of a rectifier consisting of a thyratron tube and a phanotron tube. The direct-current output of this rectifier circuit operates a saturable reactor, shown in the diagram in Fig. 3, to control the amount of power being supplied to the heating elements.

This system of control can be used efficiently for batch type heat-treating operations, such as are handled in box type electric furnaces. Full power is applied to the heating resistors while the charge is being brought up to temperature. As the temperature of the charge approaches the predetermined level, the power to the resistors is gradually decreased. When the charge reaches the desired temperature, power is still continuously applied to the heating unit, but only at a rate that is sufficient to compensate for heat losses.

Fig. 5. Cathode-ray Oscilloscope Used to Detect Flaws in Cylindrical Pieces of Iron or Steel. Test Pieces are Rotated at High Speed while Strongly Magnetized. When the Magnetic Field is Explored with a Coil, Any Flaws in the Test Piece Produce a Wave-like Pattern on Oscilloscope Screen

Cathode-Ray Tube Used for Metallurgical Tests

Another electronic device for which important applications have been found in industrial inspection and testing is the cathode-ray tube. This type of electronic tube, which was briefly described in the first article of this series, is the kind of tube used to produce the moving image in television sets. It has also found extensive use as an oscilloscope for the analysis of the electrical characteristics of various circuits.

A comparatively new instrument for the performance of quantitative and qualitative metallurgical tests on either ferrous or non-ferrous metals makes use of the cathode-ray tube. With this instrument, non-destructive tests can be made to determine case depth, core hardness, plating or cladding thickness, carbon content, brittleness, and variations under heat-treatment.

This instrument operates on the principle that the metallurgical properties just mentioned result in variations in the core loss of a tuned pick-up coil which surrounds the piece under test. These variations affect the shape of an easily interpreted visible pattern or "cyclogram," which is displayed on the cathode-ray

tube indicator screen. By means of these pattern variations, the operator can distinguish between differences in metallurgical properties of ostensibly similar parts. In Fig. 4 57-millimeter armor-piercing shot is being tested for uniformity of hardness. Two screens are used. On one appears the pattern that indicates acceptable hardness, and on the other the pattern produced by the piece under test.

The cathode-ray tube instrument has also proved useful as an inspection or a checking tool for the assorting of large quantities of parts, either automatically or manually. Some of the specific applications include sorting of SAE and N.E. steels according to chemical analysis; sorting pieces of steel of the same analysis according to heat-treatment; sorting non-ferrous metals according to structure; separating casehardened from non-casehardened pieces; separating decarburized pieces from satisfactory pieces of steel; and separating pieces of metal in which the internal stresses are excessively high from others in which the internal stresses are normal.

A slightly different arrangement is shown in Fig. 5, where a ring of steel is being magnetically tested for under-surface flaws by the use of a cathode-ray tube oscilloscope. When a symmetrical piece of homogeneous steel is properly heat-treated and then magnetized, the external magnetic field is uniform, and is traced on the cathode-ray tube screen as a straight line. Any defect in the heat-treatment, such as a hard or a soft spot, changes the permeability of the faulty region and produces a wave-like pattern on the oscilloscope screen. A second trace on the tube screen acts as a reference line and permits a fault to be spotted on the periphery of the part within a few degrees.

The cathode-ray tube is also being used for such physical measurements as pressure, impact, acceleration, stretching, etc.

The conclusion of this article—the last in the series on electronic devices—will be published in August MACHINERY.

* * *

Delivering Locomotives by Plane

Airplane transportation has been developed to a remarkable degree during recent years, but the delivery of locomotives by plane still seems very unusual. However, eighteen locomotives have been flown to Burma in the first air-locomotive flight in history, to help the British Army's supply problem there. The locomotives, of course, are not of the type that would pull our one-hundred-car freight trains, but are small narrow-gage engines weighing 12,000 pounds each crated. For the entire shipment of eighteen locomotives, twenty-seven planes were used.

Facilitating Lubricating Service in Industrial Plants

In order to provide a complete, compact, portable lubrication service for industrial plants, facilitating the transportation and dispensation of a variety of grades or types of lubricants, the Alemite Division of the Stewart-Warner Corporation, Chicago, Ill., has brought out what is known as a "Lubrikart"—a special truck for carrying lubricants around the shop.

The "Lubrikart" is mounted on 5-inch ball-bearing casters. It is 21 inches wide, 31 inches long, and 37 1/2 inches high. It is pushed around like a perambulator by one man; and being narrow, it is able to travel between rows of machines or elsewhere in a plant where space is limited.

This equipment comes in two models. One model carries two 7-gallon tanks equipped with low-pressure pumps for filling oil reservoirs on machines or hydraulic systems and for filling gear housings; one 7-gallon tank with high-pressure pump for loading hand-guns; two 1 3/4-gallon tanks with oil transfer pumps for filling oil-cans; six spout type oil-cans; and four lever type hand-guns. There is also space for waste, replacement fittings, and tools.

The second model has, in addition to the equipment just described, a high-pressure hand-operated grease pump which holds 30 pounds of lubricant, together with a hose fitted with a hydraulic coupler. This pump develops a pressure of 7000 pounds per square inch. All equipment is manually operated.

* * *

Company Reports to Employes

What may well be termed a report of the company to its employes has been published by the Warner & Swasey Co., Cleveland, Ohio, in an attractive booklet entitled "Review of 1944." In this publication, the company describes to its workers the applications in warfare of many of the weapons made on machines produced by Warner & Swasey men and women, giving a clear picture of the part played by the products of the company in winning the war.

In addition, a comprehensive review is furnished of the operating conditions of the company from the financial point of view. This review covers the years 1943 and 1944, giving the total income of the company, wages paid, money paid out for materials and supplies, and other costs of doing business, taxes paid, investments made in the business, and dividends. This financial report is arranged in a clear manner, and an explanation is given of the differences in the figures for the two years covered, so as to answer in advance any questions.

Reducing Scrap by Precautions Taken before Starting to Grind

Many Grinding Difficulties are the Result of Overlooking Some Very Simple Precautions

By R. E. PRICE, Chief Designer
Landis Tool Co., Waynesboro, Pa.

IT is apparently human nature to assume that a serious production trouble must have a deep lying cause that can be found and corrected only by an expert. In cylindrical grinding, however, the real cause is, oftener than not, something as elementary as dirty, poorly lubricated, or faulty centers or center holes, or improperly adjusted work driver dogs or spindle bearings.

The correct maintenance and use of these devices are among the first lessons hammered into a beginner—which is perhaps why, as he advances in skill, he is so likely to forget or ignore them. As a matter of fact, these devices are always the first things that should be scrutinized when pieces come from a cylindrical grinding machine out-of-round, out-of-parallel, eccentric, inaccurate in any dimension, or with chatter marks or scratches.

Importance of Clean Centers

Typical is the case of a good-sized shop which suffered from an epidemic of out-of-round work from its cylindrical grinding machines. It was nearly impossible to grind a piece that was not out-of-round. Scrap of a certain important part was almost 100 per cent, which, of course, had a disastrous effect on the shop's output of finished assemblies.

The management was convinced that there was something basically wrong with the machines; but in spite of protests that he was wasting time, the engineer sent by the machine manufacturer to correct the trouble started with first things first—the centers. He found that the center holes in some of the spoiled work-pieces were so dirty that close fits between them and the center points were impossible. He next removed the headstock and tailstock centers. Adhering to both the centers and the center holes in the work-spindles were bits of abrasive, wheel bond, and waste, which prevented the centers from seating solidly. Dirt between center points and work center holes, and between centers and spindles, is one of the most common causes of out-of-roundness.

Similar effects result if the tapers of the center and the spindle hole are not the same, for that condition also prevents solid seating and permits the center to weave. The cure is to regrind the taper on the center.

Proper Lubrication of Centers

As important as cleanliness is proper lubrication of center points. An unlubricated steel center will wear or score at the point to such an extent that it will not fit the center hole of the work, and so causes out-of-round work. In severe cases of overheating, the points may completely burn off and allow the wheel to throw the work violently out of the machine, causing serious injury to man, machine, and work.

If the part to be ground is light in weight and if the grinding operation is to be short, it may be sufficient to lubricate the centers with light machine oil; but if the part is very heavy or the grinding time long, the lubricant should be white lead and oil, or grease.

Burned points may come from several causes besides inadequate lubrication. For example, it is important that the tapers of both the center points and the center holes in the work be the same, so that they will have maximum bearing contact. If the angles are even slightly different, the work is likely to be ground out-of-round.

For precision grinding, the center holes in the work should be lapped. If the work-piece is of hardened steel, the holes should be ground and lapped after hardening. The center point must never touch the bottom of the center hole. The center holes should therefore be drilled deep, and as an extra precaution, the points should be flattened.

Regrinding of Centers

Center points should be examined often to make certain that wear has not changed the angle, made them out-of-round, or scored them. Any of these defects should be corrected at once by regrinding. In regrinding, care should be taken to make the taper of the point concentric

with the taper of the work-center shank; otherwise the work will be ground out-of-parallel. It is best to grind centers on a center grinding attachment. If one is not available, the center will have to be reground by chucking, in which event great care must be taken to make sure that it runs true. Careful checking is essential to make certain that the point and the taper are of the correct angle, and that the surface of both is of high quality.

If a center-grinding attachment is used, the first step is to rough-grind the points, using the attachment set at the proper angle. Next, the straight adjoining section of the center is rough-ground, after making certain that the table is correctly set for straight grinding. The point of the center must be held in a female center at the footstock, while the other end is held by a male center at the headstock.

To grind the long taper of the shank end, the female center is put in the headstock and the male center in the footstock, and the table set for the taper with the greatest care, for if this taper does not fit its hole accurately, good grinding will be impossible.

After making certain that the taper is correct following the rough grinding, the taper and straight sections are finish-ground. In finish-grinding the taper, the driving dog should be attached to the straight section in order to prevent damaging the taper surface, which should be left in perfect condition by the finish grinding. The last operation is to finish-grind and flatten off the point.

Variations in Depth of Center Holes

Variations in the depth of the center holes from piece to piece will cause a greater or less degree of variation in the work. If not excessive, this is not objectionable, provided the tolerances are not too close. It is, however, essential that the holes be of the same depth within close limits when grinding to a shoulder, when straight in-feed grinding is to be done between two flanges, and when locating various points longitudinally to very close tolerances.

Even with well fitting and properly lubricated center points, a job that is poorly set up may result in the wheel spinning the work so fast that the center points are burned off and the work thrown out of the machine. This may happen if the faceplate pushes the work instead of pulling it. When the faceplate pushes the work, the work-driver is likely to loosen and drop out of contact with the dog, so that the headstock no longer controls the speed of rotation of the work, with the result that it starts to revolve at high speed, driven by the rapidly revolving wheel.

The same is likely to happen if the work-drive dog is not sufficiently tightened on the work. Since the same amount of pressure that enables the dog to hold firmly on a large diameter may not hold on a small diameter, the dog should always be attached to the largest available diameter. If a work-piece is slender, the out-of-balance inherent in an ordinary work-dog may cause the work to be ground out-of-round. For parts of this type, it is desirable to use balanced work-dogs.

Out-of-roundness is also often traceable to the drive-pins. The pin should not seat itself so perfectly in the driving slot of the dog as to hold tightly. If it does not have some play, stresses that will cause out-of-roundness will be set up in the work as it revolves. When there are two drive-pins, precautions must be taken to make certain that both pins exert the same pressure on the dog. To this end, both pins should be at the same distance from the work axis. It is also helpful to provide cushions between the pins and the work or an equalizing arrangement which causes the force from one pin to react on the other.

Care of Spindle Bearings

Much faulty grinding comes from improper care of the grinding wheel spindle bearings. This is usually an easy trouble to correct. On the other hand, it may actually be caused by unnecessary tinkering. An excellent rule is to leave the spindle and its bearings alone as long as they are performing satisfactorily; if adjustments must be made, be sure to follow the maker's recommendations as to lubrication and clearances.

Much unnecessary adjustment is caused by ignorance of the operator as to the correct operating temperature of the spindle. So much emphasis has been put on the damage that can result from a spindle running too hot that the operator is likely to err by paying too much attention to keeping the temperature down. The spindle temperature can safely be as high as 140 degrees—a temperature at which the hand can be lightly held against it for a brief period. So long as that is possible, the spindle bearings should be left alone.

Often when trouble is experienced in getting the required accuracy and finish, it will be found that the spindle is running too cool. If that happens at the start of a shift, the trouble may be that the spindle is not being given a long enough preliminary run to become heated to the proper operating temperature. If after warming up, the spindle continues to run too cool, there is too much clearance between the spindle and the bearings. This trouble can be offset to some extent by wastefully frequent dressing of the wheel, but the best plan is to take up the play in the bearings.

The correct clearance and the type of lubri-

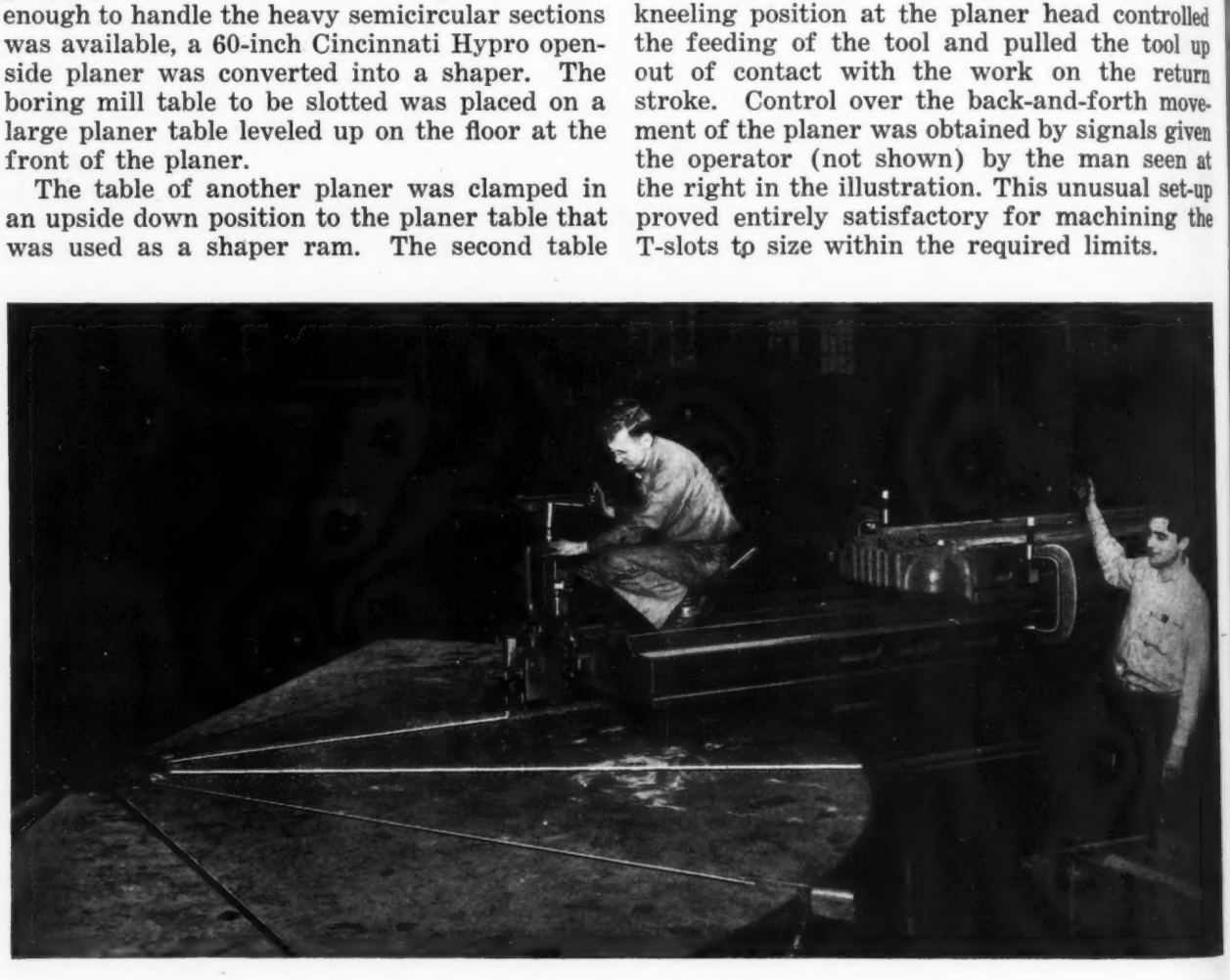
cant to use vary with the make and type of grinder. The best rule is to follow the maker's recommendations. However, when the requirements as to accuracy and finish are unusually high, it is sometimes advisable to reduce the play of the spindle by adjusting the bearings so that they have less clearance. When that has been done, it is usually necessary to change the oil, using one of lower viscosity which, by getting into the smaller clearance space more easily, will reduce the chance of spindle failure from the decreased clearance.

Improvised Shaper for Cutting T-Slots in Huge Boring Mill Table

By MAURICE SCHAPIRO
Cincinnati Planer Co., Cincinnati, Ohio

ENGINEERS of the Cincinnati Planer Co., Cincinnati, Ohio, recently solved the rather difficult problem of planing standard T-slots in an extension vertical boring mill table 18 feet in diameter in the manner shown in the accompanying illustration. Since no planer large enough to handle the heavy semicircular sections was available, a 60-inch Cincinnati Hypro open-side planer was converted into a shaper. The boring mill table to be slotted was placed on a large planer table leveled up on the floor at the front of the planer.

The table of another planer was clamped in an upside down position to the planer table that was used as a shaper ram. The second table provided the necessary range or overhang for cutting the T-slot. On its outer end was fastened a planer head, which served to hold the cutting tool. Still another planer table was placed on top of the second planer table to act as a counterweight. The operator shown in a kneeling position at the planer head controlled the feeding of the tool and pulled the tool up out of contact with the work on the return stroke. Control over the back-and-forth movement of the planer was obtained by signals given the operator (not shown) by the man seen at the right in the illustration. This unusual set-up proved entirely satisfactory for machining the T-slots to size within the required limits.



Cutting T-slots in Huge Boring Mill Table by Using Shaper Set-up Consisting of a Planer, Three Planer Tables, and a Planer Head

Precision Boring for Accuracy of Roundness and Concentricity

Examples of Work Performed on a Heald Bore-Matic for Obtaining Concentricity of Machined Surfaces

By BERKELEY WILLIAMS
The Heald Machine Co.
Worcester, Mass.

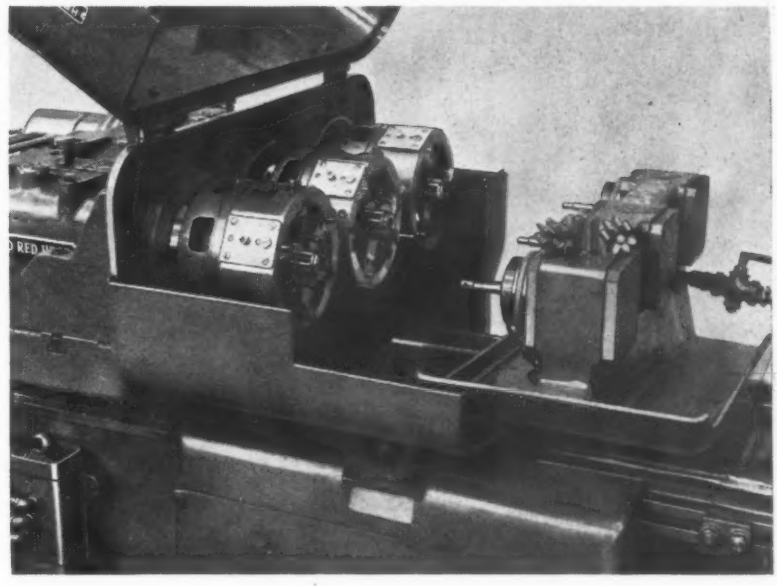


Fig. 1. Three Stations Employed for Boring Three Gears at a Time on a Heald Bore-Matic

BORIZING, so called because it is an outgrowth of precision boring, is a term used to include boring, turning, facing, chamfering, grooving, and milling operations when done on specially designed machines using single-point cemented-carbide or diamond-point tools operating at high speeds and fine feeds. Under ideal conditions and with proper care, this method can produce holes round and concentric within 0.0001 inch total indicator reading.

The degree of roundness and concentricity secured depends upon the accuracy of the locating surfaces, the manner of holding the work, and the method of machining. The holding and machining methods are, of course, often determined by the shape and size of the work. When the work permits of a choice, the selection will depend upon the tolerances for roundness and concentricity. There is no object in using an expensive fixture or tooling when a less expensive method will give the tolerances required.

Under the best conditions, a three-jaw self-centering chuck cannot be counted on to give better than within 0.003 inch total indicator reading. A sliding-jaw collet chuck should give up to about 0.001 inch, and a diaphragm chuck will give about 0.0002 inch indicator reading. In general, the geatest concentricity and roundness are secured by rotating the part, when that is practicable.

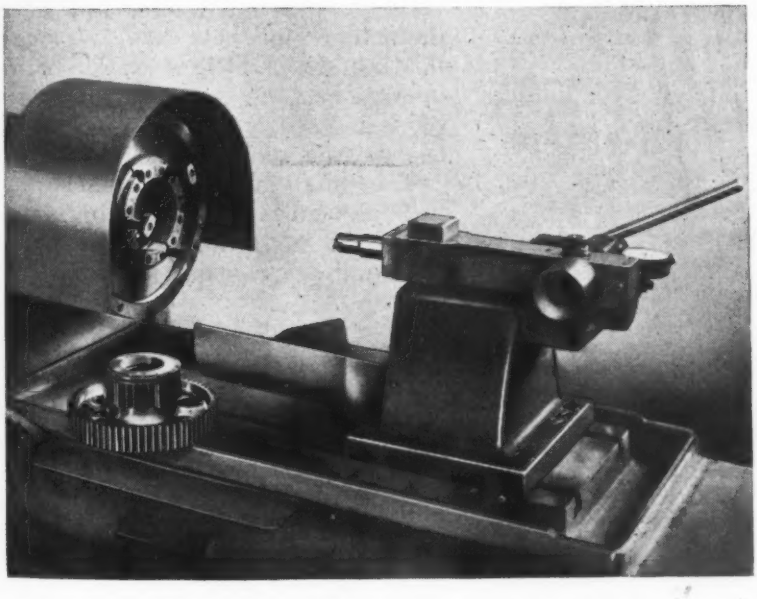
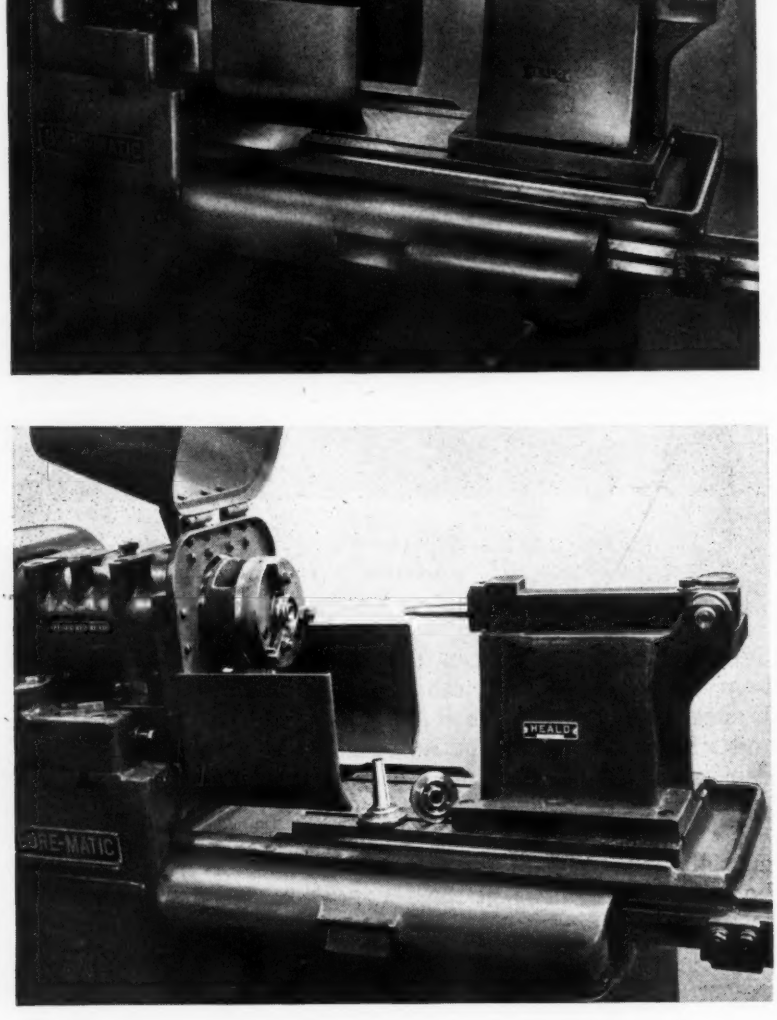
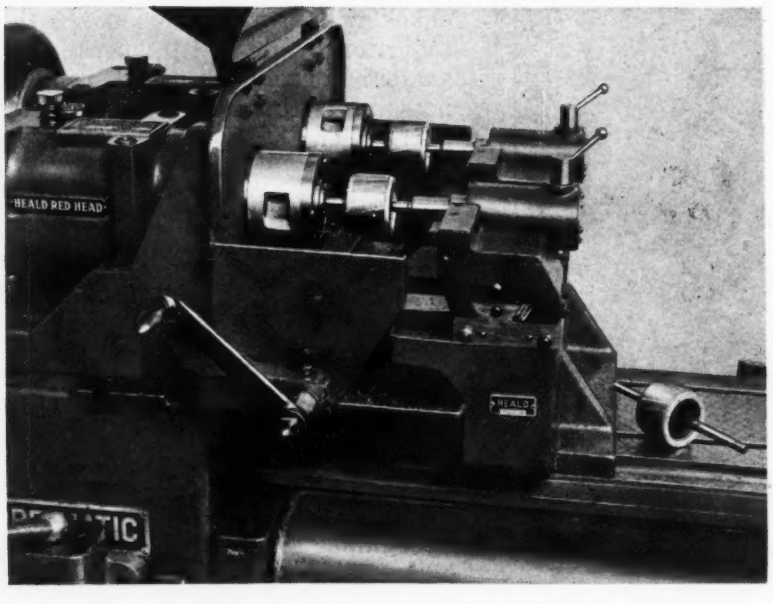


Fig. 2. Gear Located for Boring from the Pitch Line of the Smaller Step of the Cluster Gear

Examples of Work and Accuracy Obtained

Most pump gears, such as those shown in Fig. 1, need no greater concentricity than within 0.001 inch total indicator reading. Those shown are bored in sliding-jaw collet chucks, radially located from the pitch line by roll cages slipped over the gear teeth, and squared up against the rear face by pull-back fingers. These particular





chucks are air-operated, and can be equipped with different jaws and roll cages to hold various sizes of gears. To get high production, this machine has three stations, each provided with a stationary micrometer-adjusted quill in which is mounted a single-point tungsten-carbide tipped tool.

The two-step gear shown in Fig. 2 must have the concentricity between bore and pitch line held to 0.0005 inch. The only change from the preceding case is to substitute a diaphragm chuck and to locate the gear from the smaller gear step by means of a six-roll cage, in order to increase the accuracy of location. Here, too, the gear is held endwise by three air-operated pull-back fingers, which not only square up the gear, but prevent it from cocking in the chuck and so losing concentricity. To prevent "drag" lines, the tool is retracted at the end of the boring stroke by means of a lever on the pivoted boring-bar.

The part shown in Figs. 3 and 4 must have the taper bore and the taper on the outside concentric to the very close tolerance of 0.0001 inch total indicator reading. The taper on the outside is turned first, the part being held in a special rotating fixture in which it is located from a shoulder and clamped by three straps (Fig. 3). For boring the tapered hole, the part is held in the same fixture, located from the previously turned outside diameter, and held by a spring floating sleeve (Fig. 4). For both operations, the same basic tool-block is used, although, of course, the cutting tools are different.

The small motor rotors shown in Fig. 5 must be held to limits of 2.500 and 2.501 inches on the outside and be concentric with the

Fig. 3. (Top) Machining a Part Having a Taper on the Outside

Fig. 4. (Center) Boring a Tapered Hole in the Part Shown being Machined on the Outside in Fig. 3

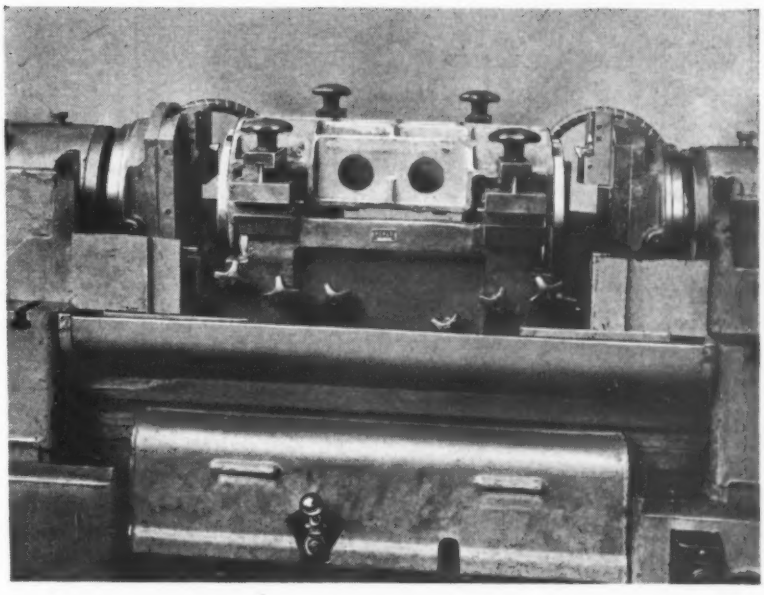
Fig. 5. (Bottom) Turning Two Rotors at One Time in a Bore-Matic Equipped with Two Heads

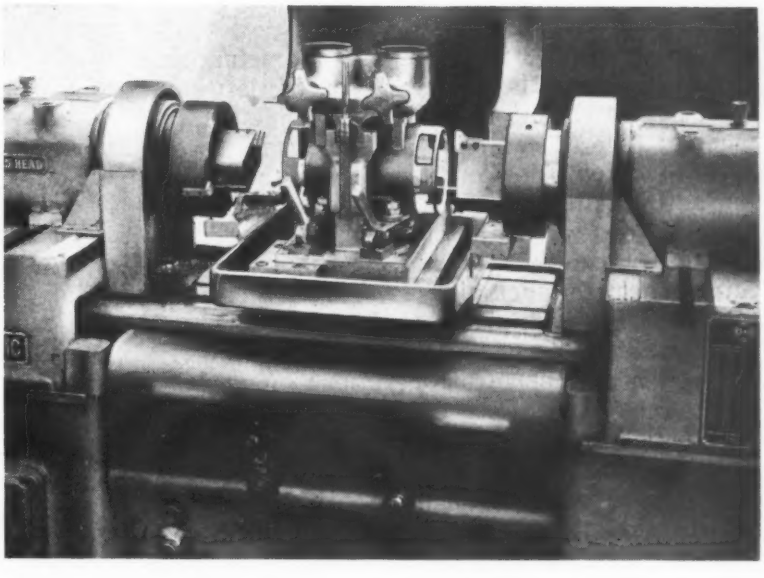
shaft within 0.001 inch. The laminations are of steel, while the cross bars are of aluminum. The rotors were formerly ground, but the soft metal "loaded" the grinding wheel to such an extent that production was greatly slowed up, and often stopped entirely. To avoid this, it was decided to precision turn the rotors, which resulted in increasing production about 340 per cent.

The machine employed for this operation has two stations for turning two rotors simultaneously. The rotor is held in a diaphragm chuck mounted on the boring head. The right-hand end of the shaft is supported by an outboard support bracket carrying a ball-bearing bushing which is advanced to slide over the rotor shaft during the turning operation and withdrawn for loading by a quick-acting lever.

It is easier to obtain high concentricity of surfaces when they can be machined at the same setting. This is done with the aircraft saddles shown in Fig. 6, which must have a high degree of concentricity between the inside and outside diameters and the rabbet. This part is too large to rotate satisfactorily, so it is held stationary on the table between two bearing heads, both of which are, incidentally, equipped with cross-feed units carrying tool-blocks and tools for generating the faces—a method which insures that the faces will be square with the bores and the outside.

The right-hand head carries five tools to bore and bottom-face a 10-inch inside diameter hole; face the outside face; turn a concentric outside surface 10.750 inches in diameter, and face the adjacent face; bore and turn a concentric rabbet to 13.750 inches inside di-





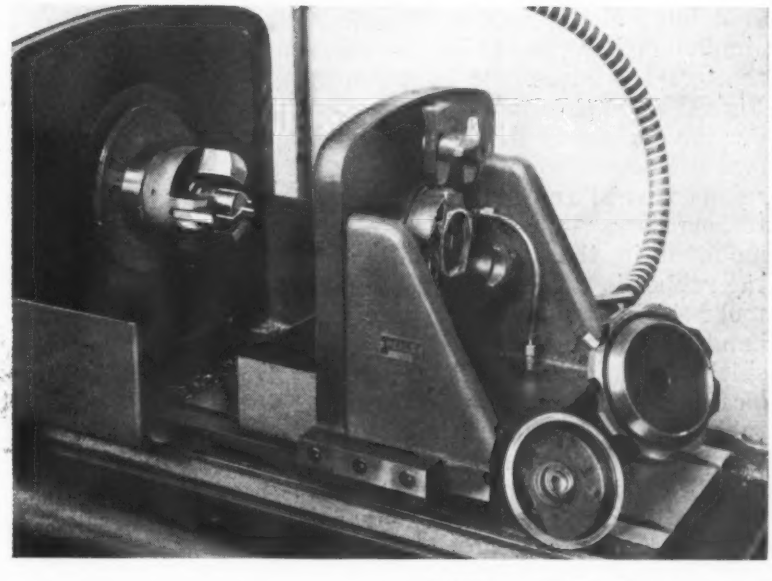


Fig. 6. (Top) Machine Provided with Opposed Boring Heads, Each Equipped with Hydraulic Tool-slides

Fig. 7. (Center) Machine with Opposed Boring Heads, Each Carrying Tools for Boring, Turning, and Facing Operations

Fig. 8. (Bottom) Boring Two Diameters, Bottom Facing, and Turning Rabbet

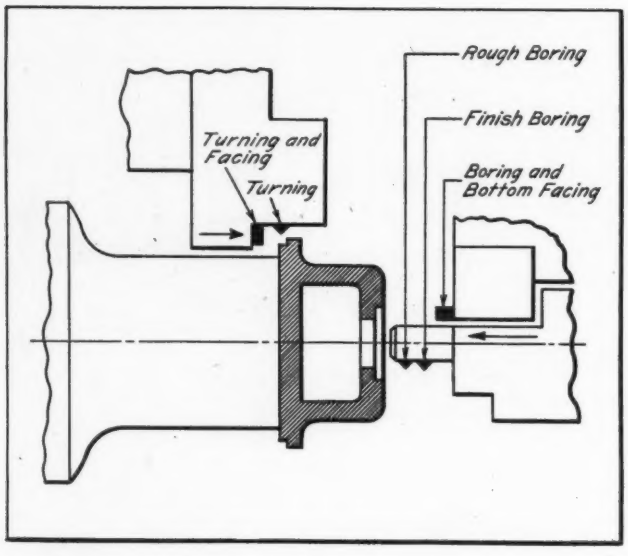


Fig. 9. Diagrammatic View of Tooling and Operations Performed in the Set-up Shown in Fig. 10

ameter and 14.250 inches outside diameter; and face the rabbet. The three tools on the left-hand head bore and bottom-face a 10-inch inside diameter; face the outside; and turn and face a 10.750-inch outside diameter. Boring and turning are done by using the table stroke, and the facing is done with the cross-feed units.

Another example of high concentricity obtained through machining several surfaces simultaneously in a single set-up is shown in Fig. 7. Here rotating, ring type quills, mounted on two opposed heads, perform operations on opposite ends of the parts. Each of these ring type quills carries one tool for turning the outside and one for plunge-cut facing the end. In addition, each head has a centrally mounted quill which carries a tool for boring the inside while the outside is being turned.

A ring type quill of different design, but which performs operations simultaneously on three surfaces that must be concentric, is shown in Fig. 8. The part is an aircraft indicator end-shield which must have two diameters counterbored and a rabbet turned and faced. The counterboring is done by two tools mounted in the central quill, and the rabbet is turned and faced by a tool held in the outer ring quill. A hand-plug is used to load the end-shield in the fixture. The part is located on the plug from the rough rabbet, and the plug is located in the fixture from its outside diameter. After the part has been clamped in place with three straps, the plug is removed.

The part shown in Figs. 9 and 10 has a rabbet and outside surface at the back, and two bores at the front, all of which must be closely concentric with each other. The obvious method would be to rechuck the part after machining the two bores, in order to turn the outside surface and the rabbet, but rechucking would make it difficult to secure adequate concentricity.

The method shown was devised in order not only to do away with rechucking, but also to enable all cuts to be taken simultaneously. Production is doubled by using a two-head machine, both heads performing identical operations. The parts are rotated. Each station has a boring-bar on the table which carries two tools, one for roughing and one for finishing the smaller bore. The table also carries a tool-block with one tool for boring and facing the counterbore.

While these cuts are being taken, the outside diameter of the flange is turned and the rabbet is faced and turned from the rear. The tools for these operations are carried by a tool-slide mounted on the bridge between the two boring heads. They are fed in from the rear by means of a push-rod and linkage actuated by the forward movement of the table. This is a method of tooling that can well be used more than it is to secure simultaneous machining of surfaces that must be highly concentric.

The specific cases referred to in this article exemplify several points that should be kept in mind when planning a job of borizing surfaces that must be concentric. They are:

1. If possible, it is usually best to rotate the part.

2. When this is done, the holding method should be selected to fit the degree of concentricity needed. From least to greatest concen-

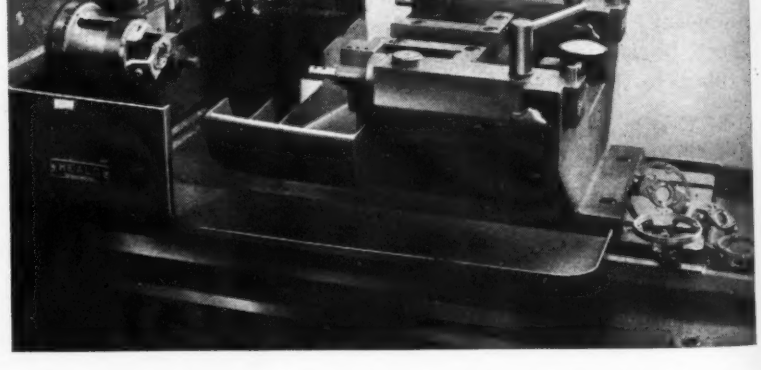


Fig. 10. Machining a Part Having a Rabbet, Outside Cylindrical Surface, and Two Bores, All of which Must be Closely Concentric with Each Other

tricity, the methods are: Three-jaw self-centering chuck; sliding-jaw collet chuck; diaphragm chuck.

3. If the part cannot be revolved, or if it is so large or unbalanced as to make revolving impracticable, an attempt should be made to devise some way to machine all of the surfaces at a single set-up.

* * *

Machine Tool Companies Cooperate in Export Trade

Four leading machine tool manufacturers have formed the Amtea Corporation (American Machine Tool Export Associates) to be made up entirely of members within the machine tool industry for the purpose of handling export business in Latin America. The founder companies are the Landis Tool Co., Waynesboro, Pa., manufacturer of grinding machines; Lodge & Shipley Machine Tool Co., Cincinnati, Ohio, manufacturer of engine lathes; Kearney & Trecker Corporation, Milwaukee, Wis., manufacturer of milling machines; and Warner & Swasey Co., Cleveland, Ohio, manufacturer of turret lathes. It is expected that the group will later include machine tool builders of other types of equipment such as drilling machines, boring machines, shapers, planers, additional types of grinding machines, gear-cutting machines, power presses, etc. The new corporation will operate with its own capital, buying directly from the member manufacturers, and selling to the trade throughout Latin America.

The officers of the organization are: President, Joseph L. Trecker, executive vice-president, Kearney & Trecker Corporation; vice-president, Walter K. Bailey, vice-president, Warner & Swasey Co.; vice-president, M. A. Hollengreen, vice-president, Landis Tool Co.; and secretary-treasurer, William L. Dolle, president, Lodge & Shipley Machine Tool Co. Fred M. Read, foreign sales manager of Kearney & Trecker Corporation, is general manager. The corporation will have offices in the Empire State Bldg., 350 Fifth Ave., New York City.

* * *

Gear Production Still Increasing

The gearing industry, as represented by the members of the American Gear Manufacturers Association, Empire Building, Pittsburgh 22, Pa., showed an increase in volume of sales for March, 1945, the last month for which complete statistics are available, of 2.4 per cent, compared with February. This report does not include turbine or propulsion gearing, but refers entirely to what are termed industrial gears.

Mounting Cemented-Carbide Cutting Blades Mechanically

In a paper presented before the last annual meeting of the American Society of Mechanical Engineers, W. L. Kennicott, chief engineer of Kennametal, Inc., Latrobe, Pa., called attention to a recent development in the use of cemented-carbide cutting tools—the adoption of solid carbide blades mechanically held in standard or special tool-holders. Mr. Kennicott claimed that there are several advantages to be gained by this method over the conventional design of brazing the carbide tip to a steel shank. The advantages claimed for the use of solid carbide blades may be enumerated as follows:

1. The number of regrinds possible with a solid carbide boring tool is greatly increased over what would be possible with a small tipped boring tool, where the regrinds are limited by the size of the tip.

2. The steel shank of small tools, after milling away a portion for the tip, is frequently weaker and less rigid than a solid carbide tool of the same original cross-section.

3. The use of mechanically mounted carbide tips for heavy cutting eliminates the possibility of strains caused by the difference in thermal expansion of steel and carbide. When small and moderate-sized carbide tips are used, the strain set up between the tip and the shank in a brazed tool is of minor importance; but when very large tips and heavy shanks are brazed, the strains may become troublesome.

4. The grinding of solid carbide blades is much simpler than the grinding of a tipped tool, with the different expansion for tip and shank materials. This is especially true of large roughing tools.

The use of solid carbide blades on heavy roughing work has been made possible through improvements in the physical properties of cemented carbide during the last few years. The breaking strength has been nearly doubled, permitting an overhang of the blades beyond the steel seat and mechanical clamping means of various types. The greatly reduced price of cemented carbides has also been a factor in this development. At the higher price of a few years ago, it was economical to mount a small tip on a large steel shank; but with the price as low as it now is, it has become practical to use much larger tips, and in many cases solid carbide cutters held in tool-holders.

* * *

Many a labor leader gets a 10 per cent wage increase for his union members, and then advocates union practices that increase the cost of living by 20 per cent.

Engineering News

The Gas Turbine Finds Its Place in Aviation

There are today two new power plants for aircraft engines that will become of great importance in aviation in the near future. One of them is the jet-propulsion engine, and the other is the gas-turbine propeller drive. In both cases, continuous-combustion gas turbines are the prime movers.

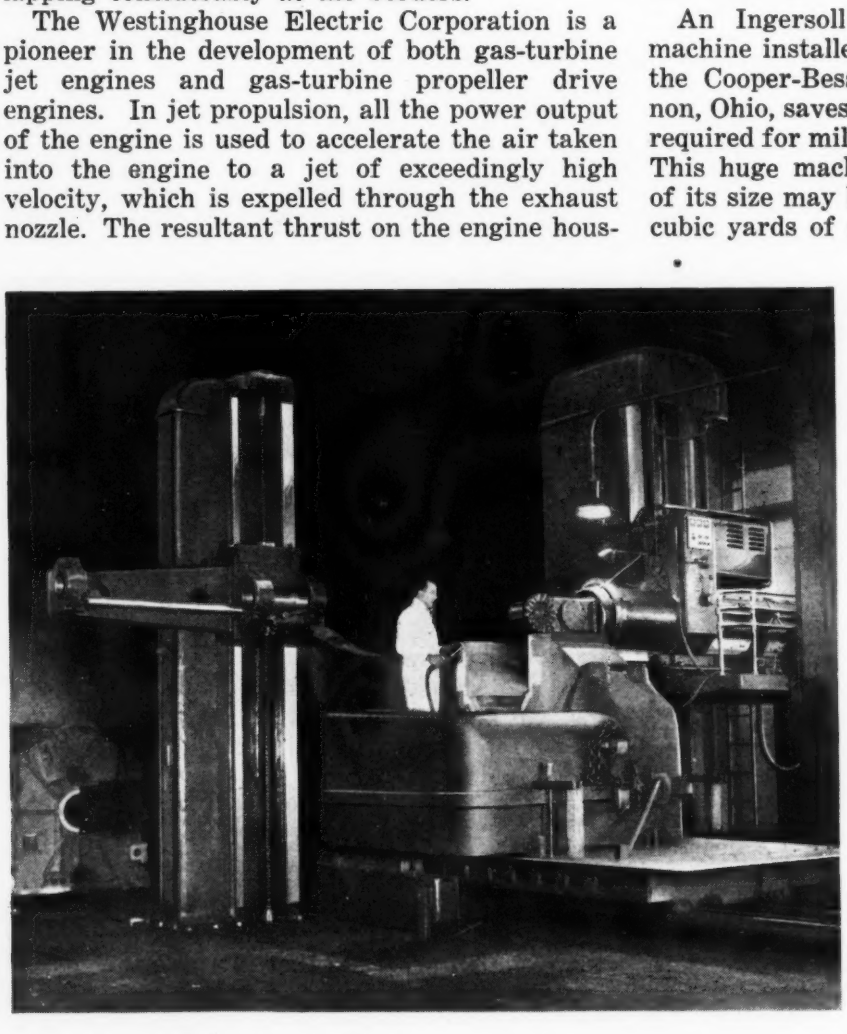
The use of gas turbines in aircraft will eventually result in new design concepts for air transportation. While the reciprocating gas engine will undoubtedly continue to hold its present position in the field for lower speeds and altitudes, the gas turbine is likely to come into its own both as a jet engine and for driving propellers in high-powered planes for high speeds and altitudes. All three types of drives appear to have a definite field, although, of course, overlapping considerably at the borders.

The Westinghouse Electric Corporation is a pioneer in the development of both gas-turbine jet engines and gas-turbine propeller drive engines. In jet propulsion, all the power output of the engine is used to accelerate the air taken into the engine to a jet of exceedingly high velocity, which is expelled through the exhaust nozzle. The resultant thrust on the engine housing is the reaction to the force required to accelerate the intake air to its exhaust velocity.

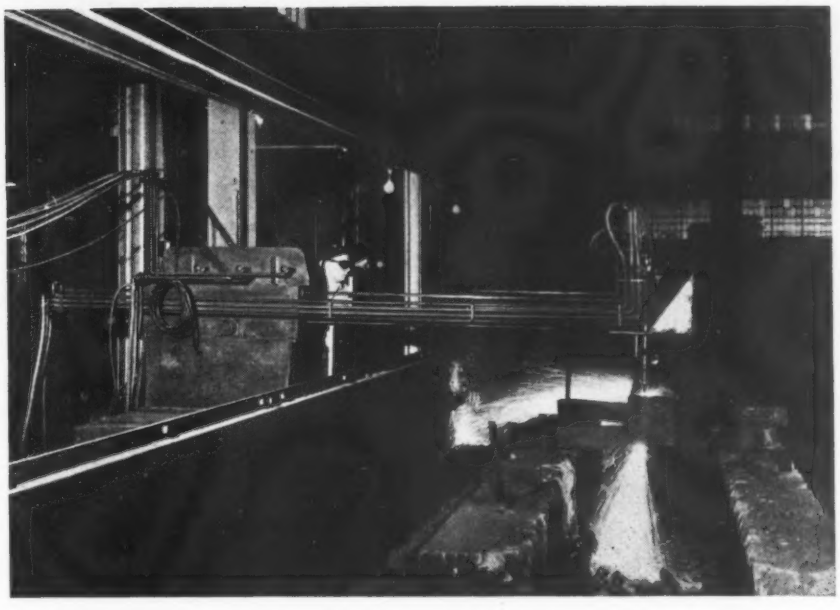
Gas turbines for propeller drives can be built to work at peak temperatures of 1500 degrees F. This temperature is limited by present metallurgical knowledge. With further progress in that field, the life of the highly stressed turbine parts operating under high temperature may be increased and the limiting temperature may be beyond 1500 degrees F. The gas turbine will permit a much lighter power plant installation than the reciprocating engine. It is estimated that the installed weight of a geared gas-turbine engine should be less than three-fourths the weight of an equivalent reciprocating engine installation.

Huge Machine Reduces Machining Time for Compressor Beds 40 Per Cent

An Ingersoll open-side milling and boring machine installed at the Mount Vernon plant of the Cooper-Bessemer Corporation, Mount Vernon, Ohio, saves 40 per cent of the time formerly required for milling and boring compressor beds. This huge machine weighs 131 tons. An idea of its size may be conveyed by the fact that 350 cubic yards of concrete were necessary for the foundation for the machine. The table of the machine is 98 inches wide by 26 feet long. Nine separate motors ranging from 1/3 to 20 H.P. are employed in the operation of the machine. It permits of a wide range of operations from the drilling of 3/4-inch holes at a speed of 240 R.P.M. to the boring of 30-inch diameter cylinders at 2 R.P.M.



Huge Ingersoll Open-side Milling and Boring Machine at the Cooper-Bessemer Plant in Mount Vernon, Ohio, which Reduces the Time Required for Machining Compressor Beds by 40 Per Cent



A Machine Built by the Air Reduction Co. for Cutting Blooms and Billets to Size by Means of Twin Water-cooled Oxy-acetylene Torches in the Ambridge, Pa., Plant of the A. M. Byers Co. This Machine has a Capacity for Cutting to Length All Sizes of Blooms up to 24 by 24 Inches

Using the Electric Arc for Re-Soling Horseshoes

A blacksmith of Coshocton, Ohio—Charles H. Chism—is successfully using Shielded-Arc welding for building up worn horseshoes by electric welding without removing the shoes from the horse's hoofs. According to the Lincoln Electric Co., Mr. Chism has found that electric welding does away with the need of taking off worn horseshoes and putting on new ones, and that the horse's shoe does not get as hot as it has to be when it is originally put on and shaped to fit the hoof. After the welding operation has been performed, the horse's hoof is cooled by pouring on water. A light coated high-carbon electrode, 1/8 inch in diameter, is employed for horseshoe re-soling.

Overcoming Effect of Hammer Vibrations on Furnaces

In a large drop-forging plant, the vibration transmitted from the hammers caused the arches of the furnaces to collapse after having been in operation about three months. The high maintenance costs and loss of production while rebuilding the furnaces prompted the company to investigate the possibility of mitigating this vibration trouble.

It was considered impracticable at that time to mount the hammers on vibration isolating equipment. Instead, it was deemed advisable to isolate the furnaces. As a test, one of the furnaces was mounted on Korfund steel spring isolators made by the Korfund Co., Inc., Long Island City, N. Y. Since the furnaces were 20 to 30 feet long, 8 to 10 feet wide, and up to 10 feet high, weighing loaded from 150,000 to 200,000 pounds, it was obvious that heavy-duty isolators were needed. The results obtained with this one furnace were so satisfactory that the drop-forging company installed similar isolators under the remaining sixteen furnaces.

Nylon Finds New Application in Brush Manufacture

The uses of Nylon seem to be unlimited. At first thought of simply as a fabric to be used for purposes where silk was formerly employed, a great many uses far removed from the fabric field have since been found for this material. One of the unusual applications of this material is for paint brushes. The paint brush industry three years ago, when Nylon was first employed for this purpose, declared it the most significant advance in the last twenty-five years of brush manufacture. It now seems to be agreed that the Nylon bristle brush, originally developed for war use, offers exceptional possibilities for better post-war paint brushes. More than a million and a half of such brushes have been supplied by industry to the Navy.

Huge Passenger Planes Designed for Post-War Use

A plane that will accommodate 200 passengers has been designed by the Consolidated Vultee Aircraft Corporation for the Pan-American World Airways. The plane is scheduled for production as soon as wartime restrictions are removed. It has a 4200-mile cruising range, and is driven by six engines that are capable of flying it at cruising speeds of from 310 to 340 miles an hour.

Editorial Comment

Some of our law-makers in Washington are greatly concerned—and justly so—with the problem of insuring full employment in the peacetime years to come. Their concern is commendable, but it is unfortunate that the methods uppermost in their minds involve additional laws, regulations, and government interference. The old saying, "That government is best that governs least," is just as true today as it was when first uttered, notwithstanding the fact that the modern trend in government all over the world runs contrary to that principle. What we need to insure continued employment and material well-being for our people is not more laws, more government bureaus, more interference with industry, but less. In fact, the modification or repeal of some of the laws now on the statute books would help greatly to insure full employment in the years to come.

Full Employment is Insured Only through Free Enterprise

The choice is between socialism—whether you call it by that name or not—and freedom of individual enterprise. There is no middle road. The minute the Government begins to usurp individual rights, whether they be the rights of the men who create employment or of the men who are capable of filling the jobs that are provided, the start is made in the forging of a chain, link by link, that ultimately shackles freedom on the part of both job-creator and job-seeker.

If American business men really believe in the principle of free enterprise, they must fight for it wholeheartedly. The forces that are determined that there shall be no free enterprise in the future are well organized. They work insidiously in political, educational, and labor organizations, in youth movements, and even through religious channels.

The American Way of Life is Challenged by Powerful Forces

There has been a revolution in the methods of our Federal Government within the last twelve years. We are governed today more by bureaucratic rulings and executive orders than we are by Congressionally defined laws. This revolution, which has been clearly in the direction of suppressing freedom of ownership and freedom of enterprise, has obviously been directed by forces that are not wholly in the open and that perhaps have not even been understood by the members of Congress who, through legislative action, have made this revolution in governmental powers possible.

The question is whether the American people want full employment through socialistic governmentally controlled enterprises or through the initiative of free enterprise. Russia presents a good example of the former method. There is full employment in Russia, but very little individual freedom. Should it not be possible to provide full employment for all able and willing to work and, at the same time, maintain individual freedom of enterprise and freedom on the part of the worker to decide, himself, for whom he shall work?

Which Do We Choose: Free Enterprise or Bureaucratic Rule?

If we are to preserve what we have been proud to call the American way of life, our law-makers should give some thought to the encouragement of free enterprise and individual initiative, in order that thereby full industrial activity, which means full employment, may be fostered.

There are clearly forces within the Administration that would like to make wartime restrictions on industry permanent. It is time that business men and industrialists alike thoroughly recognize this trend and begin to voice, as forcefully as possible, their opposition to the extension of wartime restrictions on free enterprise into the peace years to come.

▼ ▼

No one man or group of men can ever possess the knowledge and judgment required to run the industries of a whole country, or even an entire group of industries. Dictatorship smothers originality, initiative, and imagination. A man with ability cannot do much in the way of building up his country if he is completely tied up with regulations, restrictions, and bureaucratic directives; we do not want that kind of thing in America.

Ingenious Mechanical Movements

Mechanisms Selected by Experienced Machine Designers as Typical Examples Applicable in the Construction of Automatic Machines and Other Devices

Cam Designed to Operate on Alternate Revolutions

By L. KASPER

The design of a cam that transmits an irregular oscillating motion to a shaft on each alternate revolution of the camshaft is shown in the accompanying illustrations. This is accomplished by guiding the follower roll *C* along two different tracks, the concentric track or path indicated by dotted lines at *m*, Fig. 2, which imparts no movement to lever *D*, and the cam path *n*, Fig. 1, which actuates the lever *D*, producing a rise and fall of this lever with a short rest period at the peak.

Referring to Fig. 1, which shows two views of the mechanism, shaft *A* carries the cam *B*, which rotates in the direction indicated by the arrow *a*. Shaft *J* receives its motion from cam *B* through the follower roll *C* carried on lever *D*. Cam *B* is machined to receive the levers *E* and *F*, which are recessed into it to less than half the depth of the cam groove.

A better idea of the shape of lever *F* can be obtained from the view in the upper right-hand corner of Fig. 2. The inner edges of levers *E* and *F* are shaped to form a part of the outer edge of the circular follower groove. The outer edges of these levers are shaped to form a part of the inner edges of the follower groove that produces the rise and fall of the roll *C*. Two levers *G* on the back of cam *B* are mounted on the shafts that carry levers *E* and *F* and that extend through the body of cam *B*. Two links *H*, one on each side of levers *G*, connect the lower ends of the levers by means of two screws *K*. Screws *K* carry the springs *I*, which act on links *H* to produce a light friction between levers *G* and links *H*.

As shown in Fig. 1, cam *B* has been rotated in the direction indicated by arrow *a*, causing roll *C* to follow the rising side of the cam groove, as indicated by the dotted arrow path *n*, to the point where the roll is at the peak of the rise. It will be noted that lever *E* is nested in the recess in the outer wall of the cam groove, while lever *F* is nested in the inner wall on the opposite side.

Continued rotation of cam *B* guides roll *C* to the falling side of the cam track, as shown in Fig. 2. However, this side of the cam track is obstructed by the lever *E*, as seen in Fig. 1. When roll *C* comes in contact with lever *E*, the latter is caused to swing to the opposite side of the groove, thus opening the falling side of the cam groove, as in Fig. 2. Since lever *E* is connected to lever *F* by levers *G* and links *H*, lever *F* is caused to swing an equal amount in the same direction, thus obstructing the rising side of the cam groove.

Further rotation of cam *B*, Fig. 2, causes roll *C* to come in contact with lever *F*, but as lever *F* is locked against outward movement, roll *C* is guided in a circular path, as indicated by the dotted arrow path *m*. Continued rotation of cam *B* causes roll *C* to return lever *E* to its original position, so that roll *C* may again be guided up the rising side of the cam groove, as in Fig. 1.

The friction caused by the pressure of the springs *I* serves to hold the levers *E* and *F* in position until moved by the roll *C*. In this man-

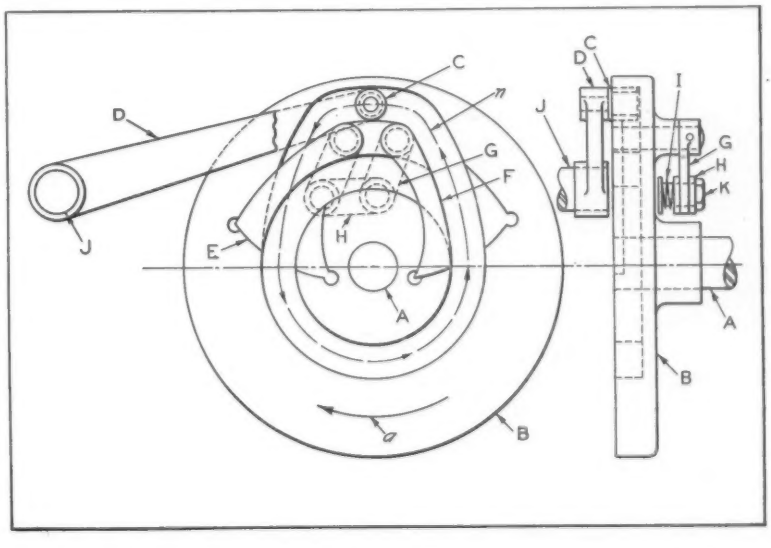


Fig. 1. Cam Mechanism Designed to Raise and Lower Lever D on Each Alternate Revolution of Shaft A

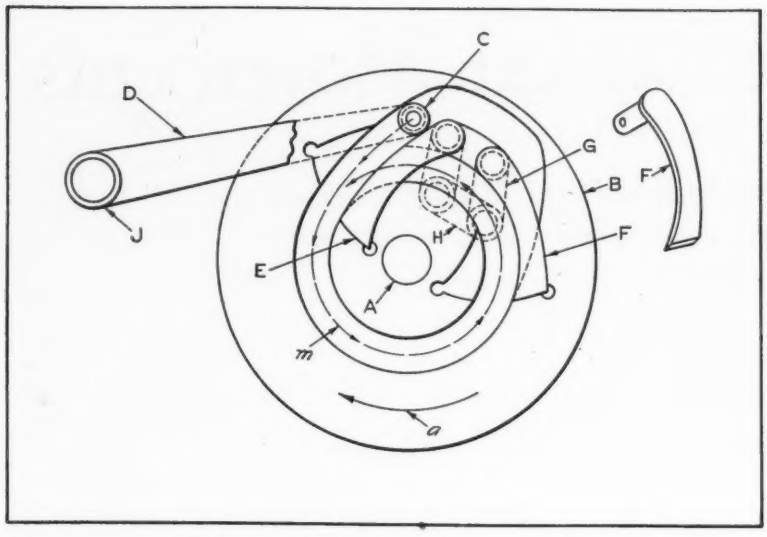


Fig. 2. Cam Mechanism with Levers E and F Set to Guide Roller C into Concentric Groove

ner, shaft *J* is given an oscillating motion during one revolution of cam *B* while roll *C* is following the irregular groove, but is allowed to remain at rest during the next rotation of cam *B* while roll *C* is following the concentric path.

Simple Indexing Device

The indexing device shown in the accompanying illustration constitutes the main mechanism of an automatic stamping device. It has proved almost as efficient as the well-known Geneva stop motion, and is much easier to produce. The main drive-shaft *A* carries the disk *B*, which has a number of teeth cut on its periphery. This disk acts in the same way as the check disk of the Geneva motion.

Fastened to the face of the disk *B* immediately above the toothed sector *C* is an operating cam or lug *D*. The driven member *E*, which is shaped like a three-pointed star, has three gear sectors *F* secured between the points of the star. As the main drive-shaft *A* is revolved, one of the sides of the operating piece *D* pushes against the side of the star wheel and causes it to revolve. The toothed sectors on disk *B* and on star-wheel *E* will then engage each other, and in the particular case shown in the illustration, the star-wheel will be rotated through 120 degrees until its motion is arrested by means of the check portions *G* coming into contact with the untoothed periphery of the disk *B*.

* * *

In the inspection of artillery shells, use is made of green fluorescent lamps, because under this light rust spots stand out clearly.

Disposal of Surplus Cutting Tools

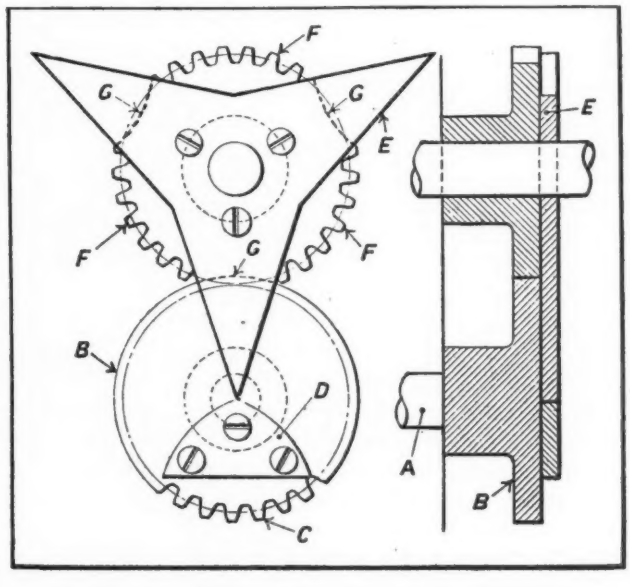
According to an announcement made by H. J. Merrick, executive secretary of the Cutting Tool Manufacturers' Association, the Department of Justice and the Surplus Property Board have approved contracts made between the Defense Plant Corporation and the Reconstruction Finance Corporation on the one hand, and the cutting tool manufacturers on the other, covering a plan for the disposal of surplus cutting tools. This plan may serve as a model for the disposal of other surplus material and equipment.

Under this plan, the manufacturer who originally made the tools will act as an agent for the Defense Plant Corporation in disposing of surplus tools through normal trade channels. The plan is designed to speed disposal of surplus tools in an orderly fashion, eliminating speculation. It requires that a minimum of one surplus tool be sold for every three new tools of the same type made by the manufacturer.

As a further insurance against increases in surplus tools, orders for new tools by the United States Government will be filled first from such stocks of surplus tools as are available.

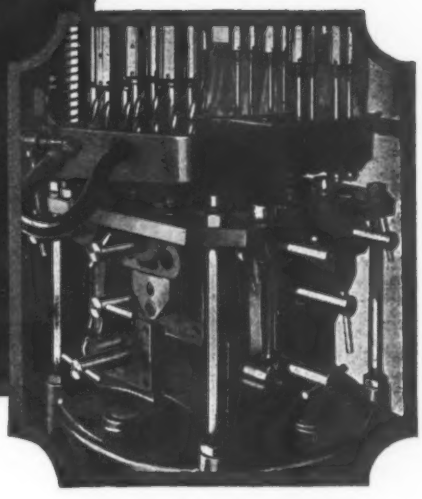
* * *

America's wartime shipbuilding capacity for ocean-going vessels is over 2000 a year, provided labor and materials are available.



Indexing Mechanism Developed for Automatic Stamping Device

Design of Tools and Fixtures



Broaching Square Oblique Hole in Small Part

The machining of accurate square holes in small parts has always been something of a problem, and when the square hole enters or leaves the piece at an angle the problem is even more difficult. If the number of parts required warrants the necessary expenditure for tools, the work can generally be handled most efficiently and with the greatest accuracy by broaching.

The accompanying illustration shows how the job of broaching a square oblique hole in a small part was accomplished in a British shop. The fact that the square hole in the part shown in

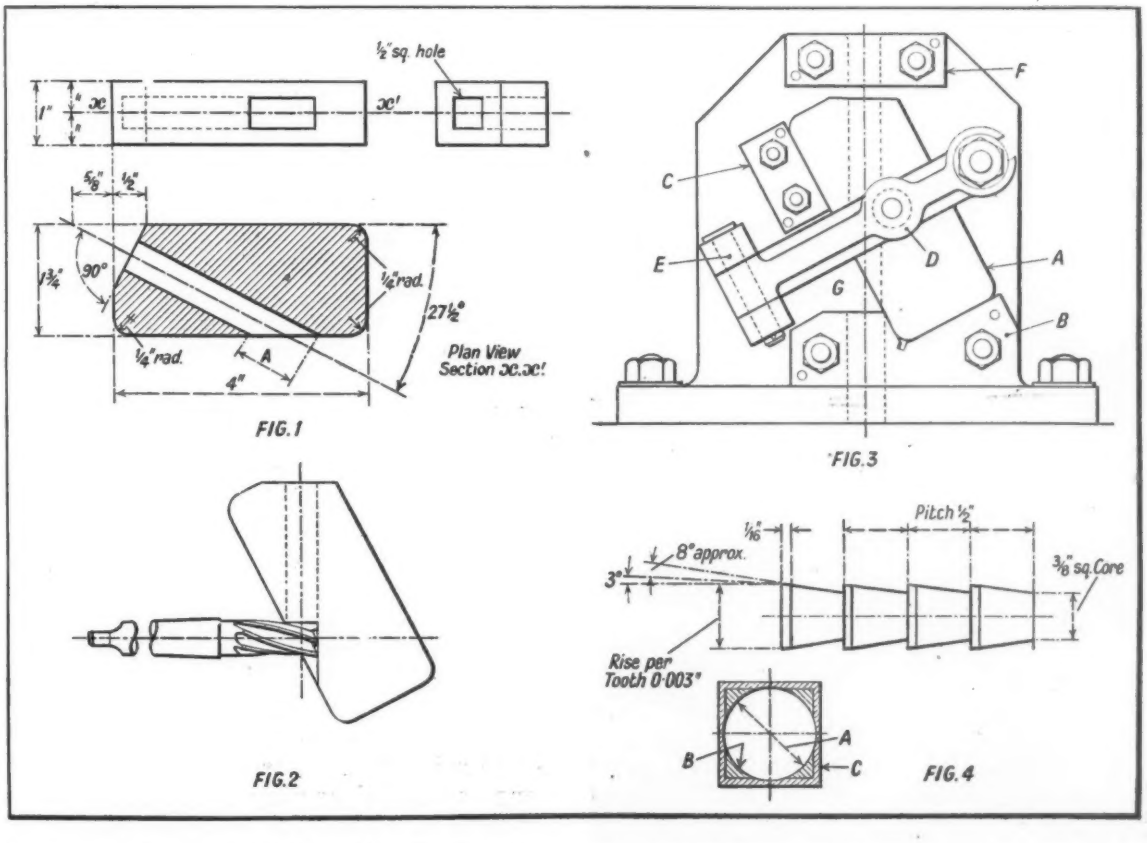


Fig. 1. Part in which Square Oblique Hole is Produced by Drilling, End-milling, and Broaching. Fig. 2. Milling Operation Preparatory to Broaching. Fig. 3. Broaching Fixture. Fig. 4. Details of Broach and Diagram Indicating Sequence of Operations

Fig. 1 passes at other than a right angle through the part means there will be a distance *A* through which the broach must operate unsupported by an opposing face.

Even though the preparatory drilling is satisfactory, there will be a high lateral pressure on the broach which will militate against accuracy and may cause breakage. The drilling, however, imposes a limitation; for upon emerging, the drill deviates from the correct location to the detriment of both the work and the drill.

The practical solution to this problem was to mill out the part for a distance *A* by an end-mill, as indicated in Fig. 2, milling the surface down just sufficiently to clear the broach. This was permissible, since the length *A* was not vital to the proper functioning of the part in the assembly. A surface was formed by the end-mill through which the drill could break easily, and through which the broach could pass without side thrust or deflection. The fact that the sharp edge of the hole at the left-hand side was a semicircle instead of a square edge as a consequence of the milling was not detrimental.

The obliquity and the necessity for having two sides of the square hole parallel to the top and bottom flat surfaces made it essential to provide a fixture. The broaching itself would have been possible by allowing the small flat surface at right angles to the hole to rest on the table; but as this takes no account of location, a simple fixture had to be designed, as shown in Fig. 3.

The fixture has a flat base and a perpendicular face. The latter is buttressed for rigidity, and carries attachments for supporting and clamping the part *A*. At *B* is a supporting cradle, resting on the base and dowelled and bolted to the vertical face. The upper end of part *A* is supported by the location block *C*. A clamp *D*, hinged at *E*, is brought down to hold the work by means of a swinging stud and nut. *F* is a small guide-block. Chips fall away at *G* and can easily be brushed clear of the fixture before reloading.

The circular hole was squared in two separate operations. The sequence of these is indicated in Fig. 4. The corners of the circular hole *A* were first taken out at *B*, leaving a hole of approximately square shape with material *C* to be removed in the second operation. The preliminary squaring was done with a broach having a much greater rise per tooth than usual. In the final phase of the work, the finishing broach was required to cut on the full perimeter of the hole, and consideration was given this fact in designing the broach.

The length of the hole is about 2 inches. It was decided that a pitch of 1/2 inch for the broach teeth would be suitable and that the rise from tooth to tooth should be 0.003 inch; that is, 0.0015 inch from the center line.

Ample chip space was provided by designing the broach teeth with cutting angles as shown in the upper part of Fig. 4. B. M.

Universal Boring Fixture and Set-up Equipment Designed for Vertical Machine

Universal Boring Fixture

By CHESTER McTASNEY
Westinghouse Electric Elevator Co., Jersey City, N. J.

The universal boring fixture shown in the accompanying illustration was developed for use on a vertical machine employed for boring operations on short-run jobs that required the center of the bored hole to be a specified distance from a milled surface within accurate limits. The illustration shows the operator making a set-up for boring operations on a pillow block. The center plug, which has a flat face located exactly on center, is removable, but can be locked in position with the face square with any one of the four radial keyways on the fixture.

The locating angle-plate has a key which slides in one of the radial keyways and serves to keep the angle-plate face and the face of the center plug parallel, so that the operator can set these members a specified distance apart by the use of an inside micrometer. The angle-plate can be bolted to the base in any desired position along the radial keyways, elongated slots being provided to permit fine adjustments.

The fixture is provided with blocks that are used to hold the work in position against the angle-plate. These blocks can be bolted to the

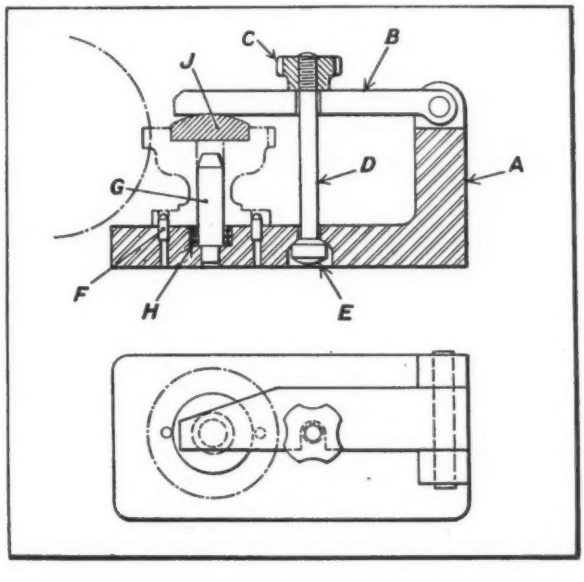
fixture in any desired position. The fixture equipment, as described, has been found very easy to set up and has made an increase in production possible.

Simple Indexing Fixture for Slot-Milling Operations

In the production of the small light-alloy aircraft part indicated in the accompanying illustration, it was necessary to mill two tab slots in the upper flange. These slots were required to be spaced accurately 180 degrees apart. The small cast part, which had previously been machined on both top and bottom faces, had a recess formed in the top flange, a hole drilled through the center, and two holes drilled and reamed in the base flange for location purposes. The number of these parts needed was fairly high, but did not justify the development of expensive production equipment. Under these conditions, the simple fixture described proved entirely satisfactory.

The location holes in the bottom flange of the part were accurately finished, and it was estimated that with working clearances over the location pegs on the jig, the error in angular spacing of the tab slots would not exceed ten minutes, which was within the required limits.

The fixture consists of a cast-iron baseplate *A* with a swing-over clamp *B*, locked in position by the thumb-nut *C* and the screw *D*. Clamp-screw *D* is made with a spherical seating head *E*, arranged so that the screw can be tilted sideways to permit the clamp *B* to be swung clear of the part for loading purposes. The base *A* carries two locating pins *F* and a plug *G*, which is slightly smaller in diameter than the drilled hole in the center of the component. There is a recess in the base concentric with plug *G*, which contains the spring *H*.



Fixture Used in Milling Slots 180 Degrees apart in Small Light-alloy Casting

A domed thrust plate *J* is dropped into the recess in the top flange of the work and makes point contact with the clamp *B*. When the fixture is in use, the work is placed over plug *G* (which gives a rough location), and is pressed downward against the pressure of spring *H* to engage the locating pins *F*. Clamp *B* is then swung into position and locked by nut *C*.

After the first slot is machined, the work is indexed to the second position. This is accomplished by releasing thumb-nut *C* to allow the work to rise under the action of spring *H* until it is clear of the locating pins. The piece is then turned around plug *G* to the second position and again located over pins *F* and clamped as before for milling the second slot.

Die for Forming Tension Clip

By L. KASPER, Philadelphia, Pa.

In the illustration on the following page, is shown a forming die of interesting design, built for use in the production of clips like the one seen at *W*, Fig. 5. This clip is made of tempered steel and is required to have the ends closed under a definite amount of spring tension. It was found impossible to form this clip in the conventional manner by bending it around a pin, due to the spring-back of the material. The die shown in the illustration, however, performs the forming operation as required, placing the contacting ends under the desired tension. End and plan views of the die are shown in Figs. 1 and 2, the retaining plate *F* (Fig. 1) being omitted in the views shown in Figs. 2, 3, and 4.

Referring to Fig. 2, plate *A* carries plate *B* and two plates *C*, which are spaced to act as guides for the slides *D*. The work *W* to be formed has been crimped on the ends in a previous operation. It is placed between pin *H* and plates *B* and *C*, plates *G* serving to centralize the piece. Slide *E* is supported between guide plates *I*, and is in contact with the ends of slides *D*. Slide *E* is provided with a slot, the forward end of which is machined at the proper angle for operation by the angular surface at the lower end of cam *J* (Fig. 1) which is mounted in the press ram. As the ram descends, cam *J* enters the slot in slide *E* causing it to move forward and advance the two forming slides *D*.

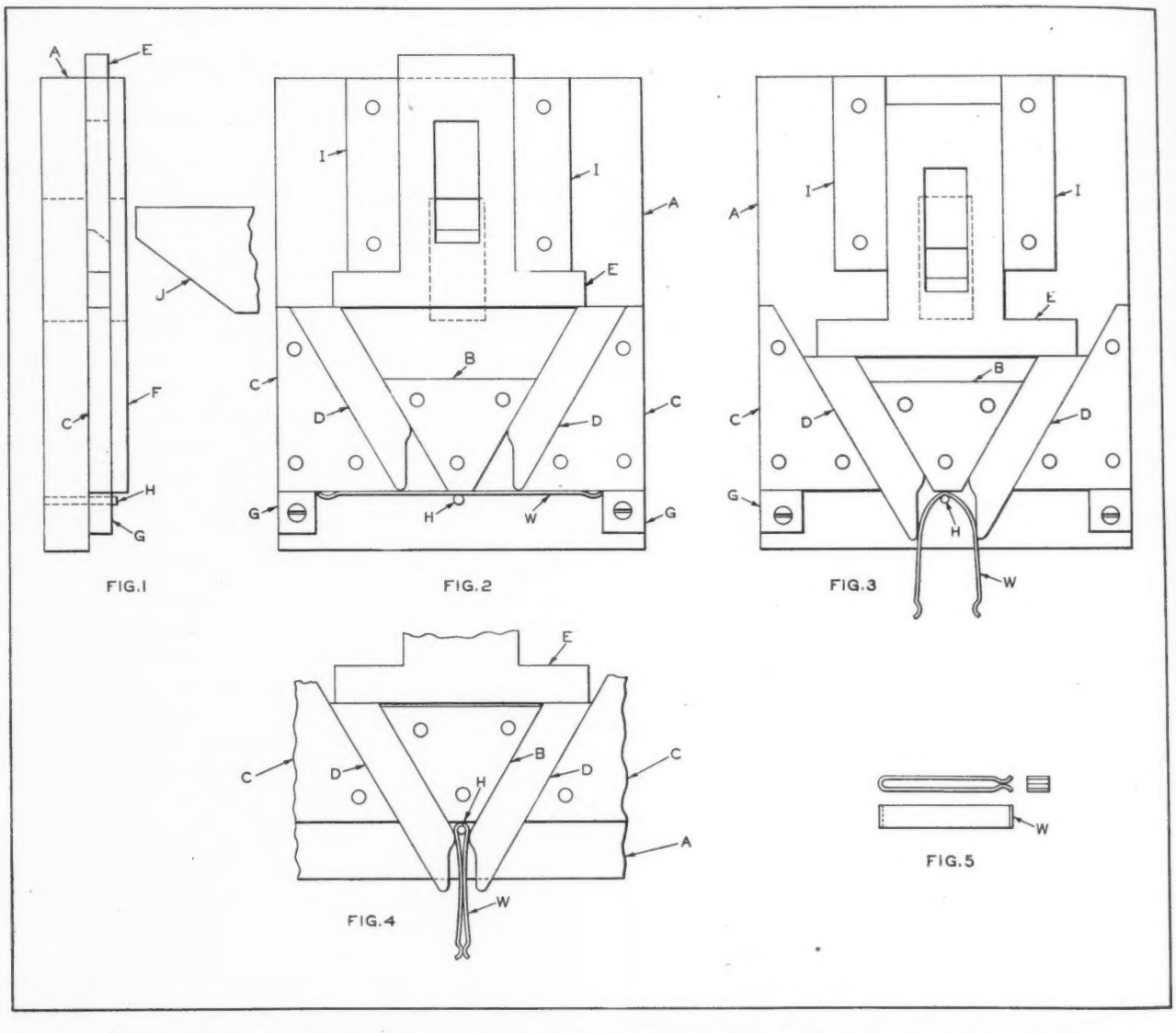
The first stage of the operation forms the work to the shape shown at *W*, Fig. 3. It will be noted that up to this point in the forming operation only the extended ends of slides *D* have come in contact with the work. At the

time slides *D* made initial contact with the work, their ends are widely separated, as shown in Fig. 2. The effect of the downward moving slides *D* is to bend work *W* on a large arc of curvature. As slides *D* continue their downward motion, the ends move closer together, causing the work to be bent or formed progressively to a smaller arc of curvature.

At the completion of the forming operation, the cam surfaces of slides *D* have come in contact with work *W*, as shown in Fig. 4, to produce the required final "set" in the spring material. The angular direction in which the slides *D* move makes it possible to vary the amount of tension produced in the work by merely adjusting the ram of the press to vary the length of the forward movement of the slides. Two springs (not shown) attached to slides *D* serve to return them and slide *E* to their rear positions on the die base as the ram of the press ascends.

Electrical Rust-Preventive Equipment

It has been conservatively estimated that rust causes a total loss of half a billion dollars a year, especially in its destructive effects on steel tanks, piping, and steel structures in general. Equipment known as "Rusta Restor," made by the Johnston & Jennings Co., 864 Addison Road, Cleveland 14, Ohio, and described in bulletin R-181, issued by this company, provides permanent protection against the rusting of such structural equipment as steel tanks and other steel structures. It is estimated that the first cost of this rust-prevention equipment is often less than the cost of just one good paint job. The operating costs are very low, because the rust-preventive unit uses the current of only a single light bulb at low voltages.



Figs. 1 and 2. End and Plan Views of Die Designed to Form Tempered Steel Clip W to Shape Shown in Fig. 5. Fig. 3. First Stage in Clip-forming Operation. Fig. 4. Die and Work at Completion of Forming Operation. Fig. 5. Formed Tempered Steel Clip

Securing Diamonds in Wheel-Dressing Tools

By HARRY L. STRAUSS, Jr.
National Diamond Hone & Wheel Co., New York City

THERE are four principal methods by which the diamonds are secured in tools for wheel-dressing purposes: (1) Brazing; (2) casting; (3) powder metallurgy; and (4) induction heating.

The brazing method was probably the first one to be used in making diamond tools. A good grade of easy flowing hard solder is used, melted by the aid of an oxy-acetylene torch. First, a hole is drilled in a piece of round stock. Then the diamond is inserted in this hole with the point facing upward, and a center punch is used to peen over some of the metal around the hole to hold the diamond in place. The solder is next applied, heating the steel and diamond slowly.

In the casting process, molten metal is poured around the diamond, which is held in place during this operation by some mechanical means. Sometimes the "lost wax" or centrifugal casting method is used. The molten solder from a crucible is poured into a mold containing the diamond and the tool in which it is inserted. The tool is so held that centrifugal force can be used to fill with molten solder all the crevices of the tool holding the diamond.

In using the powdered-metal process, various powdered materials may be employed. The author has successfully used alloys containing a high percentage of copper, and has thereby obtained a fine grain structure in the holding material and a homogeneous appearance.

The diamonds may also be mounted by a sintering process, employing graphite molds and cemented-carbide powder. The molds are round plates having equidistantly spaced cavities of any suitable diameter, usually 3/8 inch. These cavities are filled almost to the top with carbide powder, which is pressed down with a graphite plunger. The plunger has previously been center-drilled in a lathe or centering machine. The diamond is held in place in the center-drilled spot by means of an adhesive, and the plunger is brought down into the carbide powder, some pressure being applied.

The entire mold formed around the diamond is then sintered in a hydrogen atmosphere. After sintering, the pellets holding the diamond are removed from the mold and are "sweated" into the tool-holder. By "sweating" the pellets in, we mean brazing, using any easy flowing hard solder, with some pressure applied to force the pellets into the tool-holders.

The induction heating method makes use of practically instantaneous heat generated at the required point. In this case, the solder is placed in a previously drilled hole and the diamond is held in place by a jig. The solder melts quickly and flows around the diamond.

All four methods have some advantages and some disadvantages. In the brazing method, the diamond and steel holder are less subject to expansion and contraction strains, because the heating is not sudden or severe. When the work is carefully done, the diamond is securely held. However, if the work is not properly done, there will be a flux coating on the diamond which prevents intimate contact between the diamond and the brazing metal.

The advantage of the casting method is that the stones are easily set and centered; but the sudden contact of the molten metal with the diamond may set up stresses causing it to fracture.

The advantages of the powdered-metal method are that the diamonds can be easily centered and that the stones are held tightly because of the shrinkage of the powdered metal while sintering. The diamond is not likely to fracture as a result of this shrinkage, because the powdered metal mass is very resilient. A disadvantage met with in this method is that powdered metals are usually more brittle than solders, and there is danger of fracture in the metal bond.

The advantages of induction heating are the ease of handling the work and the fact that the solder flows well. The disadvantages are the rapid change in temperature, which might cause fractures in some diamonds, and the difficulty of centering the diamonds.

The next question is: What kind of setting should be used for different purposes?

1. Diamond tools for dressing wheels for thread grinding, and other tools where a carefully centered diamond is required, can best be made by the powdered-metal or the casting method, because with these methods it is easier to center the diamond carefully.

2. Ordinary wheel-dressing tools are most easily made by the brazing and induction heat methods. The stones are usually large and the corners not so sharp, which means that there is less chance of fracture; and accurate centering of the diamond is not so important.

3. Cluster type tools with many small diamonds should be made by the powdered-metal process. The carbide or other alloy bonds will hold the small stones firmly, and the use of the powders will permit combinations of diamonds that are not possible by other methods.

New Trade Literature

RECENT PUBLICATIONS ON MACHINE SHOP EQUIPMENT, UNIT PARTS, AND MATERIALS

To Obtain Copies, Fill in on Form at Bottom of Page 181 the Identifying Number at End of Descriptive Paragraph, or Write Directly to Manufacturer, Mentioning Catalogue Described in the June, 1945, Number of MACHINERY

Milling Machines and Attachments

CINCINNATI MILLING MACHINE CO., Cincinnati 9, Ohio. Book entitled "Engineering Data," containing 60 pages (8 1/2 by 11 inches) of detailed information on the milling machines, cutter and tool sharpening machines, and vertical broaching machines built by the company. Bulletin M-1382, showing a wide variety of Cincinnati milling machine attachments. 1

Universal Joints

CURTIS UNIVERSAL JOINT CO., INC., Springfield, Mass. Bulletin descriptive of Curtis universal joints applicable to airplanes, naval vessels, machine tools, and other machines. In connection with this catalogue, a sheet of standard Curtis universal-joint templets for draftsmen and engineers is distributed. 2

Tap Selector

THREADWELL TAP & DIE CO., Greenfield, Mass., is distributing a Tap Selector—a handy little device for selecting the correct tap for threading work to four different classes of fits. The device also gives suggested tapping speeds and the correct lubricant to use in tapping various materials. 3

Ferro-Alloys and Metals

VANADIUM CORPORATION OF AMERICA, 420 Lexington Ave., New York 17, N. Y., is resuming publication of the *Vancoram Review*, which will be issued quarterly and will cover applications of vanadium in various fields, as well as new products and abstracts of current literature. 4

Decimal Equivalents for Twist Drill Sizes

MANUFACTURERS SCREW PRODUCTS, Engineering Department, 222 W. Hubbard St., Chicago 10, Ill. Table of decimal equivalents for twist drill sizes, including letter sizes, available without charge to industrial users of fastening devices. 5

Multi-Purpose Grinder Attachment

STRONG MFG. CO., 5312 Westminster Ave., Philadelphia 31, Pa. Circular descriptive of the Strong improved multi-purpose grinder attachment suitable for a wide range of precision grinding operations in experimental work and mass production. 6

Corrosion-Prevention Specifications

E. F. HOUGHTON & CO., Philadelphia, Pa. Fourth edition of a "Digest of Corrosion Preventive Specifications," containing a brief description of the principal Government corrosion-preventive specifications and Houghton approved products for each. 7

Liquid Cooler for Machine Tools

CHRYSLER CORPORATION, AIRTEMP DIVISION, Dayton, Ohio. Catalogue illustrating and describing the Chrysler Airtemp "Packaged" liquid cooler for controlling the temperature of coolants, cutting oils, and hydraulic oils on machine tools. 8

Flat Ground Stock

SIMONDS WORDEN WHITE CO., Dayton, Ohio. Bulletin descriptive of "Air-Tru" air-hardening flat ground stock which eliminates distortion in heat-treatment. This stock is suitable for making accurate gages, fixtures, jigs, templets, tools, and small parts. 9

Microscope Aligning Instrument

CINCINNATI GRINDERS INC., Cincinnati 9, Ohio. Circular G-419-1, descriptive of the Cincinnati microscope aligning instrument, designed specifically for checking the alignment of long Cincinnati grinding machine beds. 10

High-Speed Tool-Holder Bits

CARPENTER STEEL CO., 105 W. Bern St., Reading, Pa. Folder containing information on the selection and use of high-speed tool-holder bits, available on request to tool engineers, machinists, and metalworkers. 11

Firthite Tools

FIRTH-STERLING STEEL CO., McKeesport, Pa. Catalogue FE-121, containing data, including price list, covering ten styles of Firthite general-purpose tools. Circular FE-122, containing price list of Firthite-tipped centers. 12

Spiral End-Mills

NATIONAL TWIST DRILL & TOOL CO., Rochester, Mich. Catalogue containing data on "Helex" fast-spiral end-mills, designed for milling slots, keyways, and pockets where ordinary arbor type milling cutters cannot be used. 13

Magnetic Lathe Chuck

MAGNETIC HOLDING DEVICES, INC., 2034 E. 22nd St., Cleveland 15,

Ohio. Circular announcing a new "Body Flo" magnetic lathe chuck for use in polishing, burring, or lapping ferrous metal parts either internally or externally. 14

Wire Belt Hooks

BRISTOL CO., Mill Supply Division, Waterbury 91, Conn. Bulletin describing the new line of wire belt hooks made by this company for all types of flat belting. Illustrations show method of applying the hooks to the belts. 15

Induction Heating Equipment

ALLIS-CHALMERS MFG. CO., Milwaukee 1, Wis. Bulletin B-6372, descriptive of electronic heaters for induction and dielectric heating. Bulletin B-6373, on Allis-Chalmers mercury arc converters for induction heating. 16

Drop-Forged Industrial Hardware

THOMAS LAUGHLIN CO., Portland 6, Me. Catalogue 135, showing the complete line of connecting links, hoist hooks, eye-bolts, and other industrial and marine hardware made by this company. 17

Magnetic Drain Plug for Lubricant Tanks

LISLE CORPORATION, Clarinda, Iowa. Circular announcing a magnetic drain plug designed to remove metal particles from lubricant. 18

Heat-Treating Baths and Furnaces

A. F. HOLDEN CO., New Haven 8, Conn. Folder showing Holden toolroom and small type production furnaces; also lists Holden heat-treating baths with their respective melting points, operating ranges, and uses. 19

Powdered-Metal Bearings

CHRYSLER CORPORATION, AMPLEX DIVISION, 6501 Harper Ave., Detroit 31, Mich. Catalogue containing 168 pages of data on Oilite powdered-metal bearings, including a 23-page engineering section; lists 13,000 available die sizes. 20

Stainless-Steel Fastening Devices

ALLMETAL SCREW PRODUCTS CO., 35 Greene St., New York 13, N. Y. 83-page catalogue prepared to assist designers and others to select the right size and type of non-corrosive fastening device for any job. 21

Flute Grinders

WARDWELL MFG. CO., 3167 Fulton Road, Cleveland, Ohio. Circular illustrating and describing Wardwell No. 50F automatic universal flute grinder, developed to grind both straight and spiral flutes in tools from the solid. 22

Internally Threaded Rivets

B. F. GOODRICH CO., Akron Ohio. "Rivnut Data Book," containing detailed information on tests made on the "Rivnut," a one-piece internally threaded and counterbored tubular rivet designed for use as a "blind fastener." 23

Extrusion Presses

SCHLOEMANN ENGINEERING CORPORATION, 1100 Empire Bldg., Pittsburgh, Pa. Circular illustrating Schloemann extrusion presses and examples of the rods, bars, and other type sections produced on these machines. 24

Rubber-Insulated Engine Mountings

BUSHINGS INC., 3442 W. Eleven Mile Rd., Berkley, Mich. Circular on Vibraflex rubber-insulated engine mountings, including a formula for calculating the proper mounting for any given load. 25

Coated Fabrics

E. I. DU PONT DE NEMOURS & CO., INC., FABRICS DIVISION, Fairfield, Conn. Catalogue on Fairprene coated fabrics made from synthetic elastic compositions for application where resistance to oil, water, heat, etc., is required. 26

Dust Collectors

TORIT MFG. CO., Walnut and Exchange Sts., St. Paul 2, Minn. Catalogue 29, containing information on Torit self-contained dust collectors for use in connection with grinding, cutting, and polishing wheels. 27

To Obtain Copies of New Trade Literature

listed on pages 180-183 (without charge or obligation), fill in below the publications wanted, using the identifying number at the end of each descriptive paragraph; detach and mail within three months of the date of this issue to:

MACHINERY, 148 Lafayette St., New York 13, N. Y.

No.	No.	No.	No.	No.	No.	No.	No.	No.	No.

Name ..... *Position or Title* .....

[This service is for those in charge of shop and engineering work in manufacturing plants.]

Firm .....

Business Address .....

City ..... *State* .....

[SEE OTHER SIDE]

Ground Multiple-Thread Milling Cutters

CONTINENTAL TOOL WORKS DIVISION OF EX-CELL-O CORPORATION, Detroit 6, Mich. Circular announcing ground multiple-thread milling cutters available with various thread forms. 28

Automatic Shielded-Arc Welding

LINCOLN ELECTRIC CO., Cleveland 1, Ohio. Bulletin 439, describing in detail "Lincolnweld," the new automatic Shielded-Arc welding process, and equipment used. 29

Coolant Separators

BARNES DRILL CO., 814 Chestnut St., Rockford, Ill. Bulletin 151-C, illustrating and describing Barnesdril magnetic-automatic coolant chip separators for honing and grinding machines. 30

Dual-Ram Broaching Machines

COLONIAL BROACH CO., P. O. Box 37, Harper Station, Detroit 13, Mich. Bulletin VAD-44, describing Colonial dual-ram broaching machines specifically designed for surface broaching. 31

Thread Locking System

BARDWELL & MCALISTER, INC., Box 1310, Hollywood 28, Calif. Catalogue descriptive of the Rosan locking system for locking threaded inserts and studs in all kinds of material. 32

Carbide-Tipped Machine Centers

TUNGSTEN CARBIDE TOOL CO., 2661 Joy Road, Detroit 6, Mich. Bulletin 137, describing this company's line of carbide-tipped machine centers. 33

Oil-Hardening Tool Steel

CRUCIBLE STEEL COMPANY OF AMERICA, 405 Lexington Ave., New York 17, N. Y. Data Sheet on Ketos oil-hardening tool steel, containing information on heat-treating and typical applications. 34

Electro-Mechanical Actuators and Power Systems

LEAR INC., Piqua, Ohio. Circular illustrating and briefly describing Lear electro-mechanical actuators and power systems which convert electrical energy into motion. 35

Variable-Speed Drives

WORTHINGTON PUMP & MACHINERY CORPORATION, Harrison, N. J. Circular V-1400-B10A, descriptive of Worthington "Allspeed" drives for instantaneous variable-speed control. 36

Sanding Equipment

EXACTONE TOOL & DIE CO., 4373 Melrose Ave., Hollywood 27, Calif. Circular descriptive of an all-purpose sander, known as the "Sand-O-Flex," for performing sanding, burring, and finishing operations on irregular and flat surfaces. 37

Diamond Grinding Wheels

NORTON CO., Worcester 6, Mass. Circular announcing Norton vitrified bonded diamond cup-wheels for sharpening single-point carbide tools. 38

Angle Molding Presses

WATSON-STILLMAN CO., Roselle, N. J. Bulletin 642A, descriptive of angle molding presses for molding plastic products requiring split molds. 39

Machining of Ampco Metal

AMPCO METAL, INC., Milwaukee 4, Wis. Bulletin 66, containing specific, detailed information on the machining of Ampco metal and aluminum-bronze alloys. 40

Self-Tapping Screws

PARKER-KALON CORPORATION, 202 Varick St., New York 14, N. Y. Revised catalogue of Parker-Kalon self-tapping screws, socket screws, and other fastening devices. 41

Electronic Controls

WHEELCO INSTRUMENTS CO., Harrison and Peoria Sts., Chicago, Ill. Bulletin Z6300, containing a condensed listing of the electronic controls made by this company. 42

Bright Nickel Plating

UDYLITE CORPORATION, Detroit 11, Mich. Bulletin entitled "The Udylite Process of Bright Nickel Plating." 43

To Obtain Additional Information on Shop Equipment

Which of the new or improved equipment described on pages 190-218 is likely to prove advantageous in your shop? To obtain additional information or catalogues about such equipment, fill in below the identifying number found at the end of each description—or write directly to the manufacturer, mentioning machine as described in June, 1945, MACHINERY.

No.	No.	No.	No.	No.	No.	No.	No.	No.	No.

Fill in your name and address on other side of this blank.

To Obtain Additional Information on Materials of Industry

To obtain additional information about any of the materials described on page 184, fill in below the identifying number found at the end of each description — or write directly to the manufacturer, mentioning name of material as described in June, 1945, MACHINERY.

No.	No.	No.	No.	No.	No.	No.	No.	No.

Fill in your name and address on other side of this blank.

Detach and mail to MACHINERY, 148 Lafayette St., New York 13, N. Y.

[SEE OTHER SIDE]

Thermit Welding

METAL & THERMIT CORPORATION, 120 Broadway, New York 5, N. Y. 32-page booklet entitled "Thermit Welding for Fabrication and Repair." 44

Filter Lens Chart for Welders

AMERICAN OPTICAL CO., Southbridge, Mass. Reference chart showing the proper shades of filter lenses to wear for different types of welding operations. 45

Metal-Cleaning Equipment

KLEM CHEMICAL WORKS, Detroit, Mich. Catalogue covering Klem "Kleaners" for metal cleaning and degreasing, rust removal, soldering, maintenance, etc. 46

Rotary File and Die Grinder

FORSS PNEUMATIC TOOL CO., Rockford, Ill. Circular illustrating and describing two new air-operated rotary file and die grinders. 47

Removable Stickers

AVERY ADHESIVES, 451 E. 3rd St., Los Angeles 13, Calif. Leaflet entitled "41 More Ways Removable Stickers Speed Production." 48

Buffing and Polishing Wheels

DIVINE BROTHERS CO., Utica, N. Y. Leaflet descriptive of Dico felt wheels and felt bobs for buffing and polishing. 49

Coated Abrasives

BEHR-MANNING DIVISION, NORTON CO., Troy, N. Y. Circular on "Durabonded" coated abrasives, built to resist heat and retard "loading." 50

* * *

Growth of National Tool and Die Manufacturers Association

Last September, when the National Tool and Die Manufacturers Association was formed, the board of directors set as the goal for 1945 a membership of 300 tool and die shops. On April 11, the three-hundredth member shop was enrolled, and since that time, several new member companies have been enrolled. The distinction of being the three-hundredth member plant is held by the Standard Tool & Mfg. Co., Arlington, N. J.

Using Carbide Hobs for Gear-Cutting

The use of carbide hobs for cutting marine propulsion gears has been referred to from time to time in MACHINERY and in papers read before engineering societies. At the recent joint meeting of the executive and administrative committees of the American Gear Manufacturers Association, which took the place of the Association's twenty-ninth annual meeting at Hot Springs, Va., May 21 and 22, Alfred J. Kroog, lieutenant, U. S. Naval Reserve, and Richard W. Righter, engineer with the Navy Department, read a progress report on "Carbide Hobs for Cutting Marine Propulsion Gears."

The Navy is endeavoring to develop carbide hobs to the point where the hobbing of marine propulsion gears of harder materials and smaller diameters than are now used can be accomplished on a well established production basis. The progress report made at the meeting dealt principally with the modification of a 72-inch Gould & Eberhardt hobbing machine to adapt it for cutting with carbide hobs by increasing the spindle speeds and by making such other changes as were required to obtain the best results in hobbing with carbide hobs. The report also gave a detailed account of the experiments conducted up to the present time. The conclusions drawn by the authors of the report from the test procedure are summarized in the following:

1. Modified gear-hobbing machines function with entire satisfaction for carbide hobs, and have definite advantages even when used for cutting with standard high-speed steel hobs.

2. High-viscosity cutting oils with a sulphur base should be replaced with straight mineral oils of low viscosity when used in conjunction with carbide hobs.

3. Carbide hobs should have heavy sections of carbide inserts and be mechanically clamped in place, with brazing used only as a secondary or safety measure. The hobs used in the tests had a 3/16-inch thick carbide insert brazed to a steel backing strip.

4. Comparatively light feeds of from 0.030 to 0.040 inch per revolution of the gear blank appear most satisfactory for roughing, causing less chipping. The harder wear-resistant grades of carbide appear to give best results.

5. Both roughing and finishing hobs should be made to Class A tolerances when manufactured, and even greater emphasis should be placed on the quality of workmanship than is required for high-speed steel finishing hobs.

6. Carbide hobs are entirely suitable for cutting harder materials than heretofore normally used for main propulsion gear blanks, at speeds that will materially increase production.

It was further concluded that the best operating speed for cutting a pinion of 285 Brinell hardness with a carbide hob of the characteristics of Kennametal K4H grade falls in the range between 174 and 224 R.P.M. or, say, 200 R.P.M., when using a 6-inch diameter hob.

Magnesium Association Looks Forward to Wide Post-War Use of Magnesium

At a press conference held in New York City on May 15, Edward S. Christiansen, president of the Magnesium Co. of America and president of the Magnesium Association, announced the appointment of T. W. Atkins as executive vice-president of the Association. At this conference it was emphasized that light-weight metals will be in increasingly greater demand for consumer goods after the war, as, for example, in lamps, typewriters, kitchen utensils, vacuum cleaners, and furniture. This will be in addition to the applications in the transportation and aviation industries. The supply of magnesium, it was pointed out, is practically unlimited because it is derived from sea water.

The Magnesium Association at present has forty-eight member companies engaged in the production, manufacture, fabrication, and processing of magnesium. Twenty years ago only one or two companies were engaged in the production of magnesium in this country. This growth is due largely to the important part magnesium has played in war production.

Materials of Industry

THE PROPERTIES AND NEW APPLICATIONS OF MATERIALS USED IN THE MECHANICAL INDUSTRIES

Air-Hardening Flat Ground Stock that is Non-Deforming

A flat ground stock that is air-hardening and non-deforming has been developed by Simonds Worden White Co., Dayton 7, Ohio. This stock, known as "Air-Tru," is especially designed for use where close tolerances must be maintained through heat-treating operations, such as in the making of jigs, gages, fixtures, tools, punch and die facings, and small precision parts. The new stock machines well and can be readily filed and finished in fine die work. It is supplied with a black oxide finish that tends to prevent corrosion and permits clear, legible scribing without need of a lay-out dye.....201

Plastic Packaging Materials Provide Resistance to Water and Brine

Specialized plastic materials that can be used to form a closely adhering protective envelope or film suitable for packaging a wide variety of parts or pieces have been placed on the market by Pyroxylin Products, Inc., Chicago 32, Ill. There are two groups of these materials, known as "Prox-Peel." One group includes a number of molten types, which are applied by a hot dipping procedure. The other includes several lacquer types which are flowed, dipped, or sprayed on the object and which form a protective film by solvent evaporation. Types are available in each group to meet military and naval specifications.

Both groups of films provide resistance to moisture vapor, as well as to water and brine. The film deposited by the hot-melt method is between 0.05 and 0.10 inch thick, affording protection from physical damage due to dropping, scratching, shifting, etc.

The lacquer group of Prox-Peel was developed especially for application to large pieces that could not readily be dipped. These compositions provide a thin but tough film which is easily applied to practically any type of surface. Both groups of films are loosely adherent to the surfaces on which they are applied, and can be readily stripped from them.....202

Rust Inhibitor for Protection of Parts during Production

A rust inhibitor designated No. 303 has been developed by the Plasteel Corporation, 3900 W. Jefferson Ave., Ecorse 18, Mich., for protecting ferrous and ferrous alloy parts from atmospheric moisture and chemical vapors between machining or drawing operations. The compound is supplied in the form of a powder, which is dissolved in the proportion of 2 or 3 ounces per gallon of water. Normally, the solution is applied in a pickling or washing machine as the last rinse before drying.

Although suitable for protecting parts against humid and acid atmospheres during indoor storage, the compound is not intended for use on parts exposed to the weather. The protective coating is clean, dry, and practically invisible. It is removed by a simple water rinse.....203

New Type of Natvar Plastic Tubing with Improved Qualities

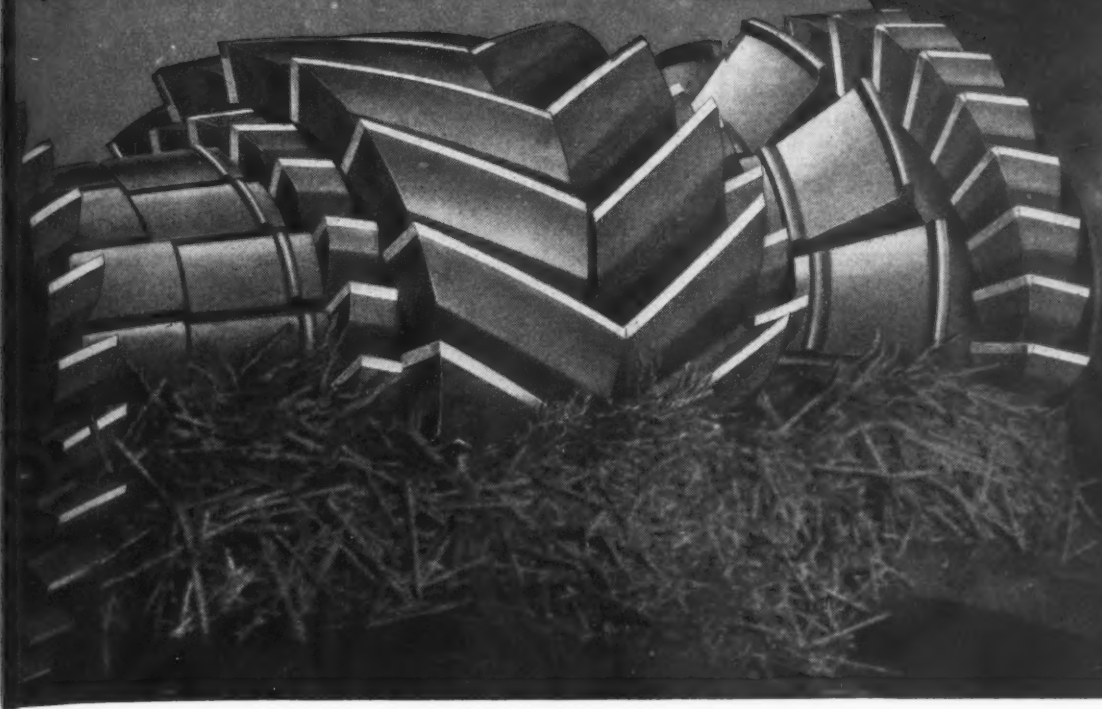
A new type of Natvar plastic tubing designated the No. 400 series, which has properties that are superior to the former No. 200 series, has been announced by the National Varnished Products Corporation, Randolph Ave., Woodbridge, N. J. In tests, the new tubing showed no deterioration or stiffness when subjected to an oven temperature of 257 degrees F. for 800 hours. After one-half hour at 380 degrees F. it showed very slight flow, and upon returning to room temperature regained its flexibility. When subjected to transformer oil at 220 degrees F. for forty-eight hours, it showed no decrease in original flexibility or evidence of swelling.

Standard wall-thickness tubings can be made from this plastic which are flexible at temperatures ranging down to minus 80 degrees F. The vinyl base makes the Natvar No. 400 tubing chemically inert and resistant to acids, alkalies, petroleum hydrocarbons, oil, etc. In addition to its already accepted use for electrical insulation, it is expected to find application as a protective covering where resistance to solvents, chemicals, heat, and cold is important.....204

To obtain additional information on materials described on this page, see lower part of page 182.

CHOOSE CUTTERS

THAT GET THE WORK OUT . . . FAST



BENEFIT from the highly specialized knowledge that enters the manufacture of Brown & Sharpe Milling Cutters—the careful selection of steels—the scientific heat treatment individualized for the type of service a particular cutter must render—and designs that result from extensive research and experimentation. With these good cutters, work is finished accurately—and finished fast. The Brown & Sharpe "know-how" of cutter manufacture pays dividends in completed jobs—Brown & Sharpe Cutters get the work out.

Catalog No. 34 showing complete line of cutters sent on request. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

There's a
BROWN & SHARPE
MILLING CUTTER
for Most Milling Needs

PLAIN • COARSE-TOOTH
HELICAL PLAIN
STAGGERED TOOTH SIDE
SIDE • HALF SIDE
INSERTED TOOTH • END MILLS
SHELL END MILLS
ANGULAR • CONVEX • CONCAVE
CORNER-ROUNDING
METAL SLITTING SAWS
SCREW SLOTTING
SPROCKET WHEEL
GEAR

. . . We urge buying through the Distributor

B·S

BROWN & SHARPE CUTTERS

Machine Tool Builders Hold Regional Meetings

Effective Methods for Handling Government-Owned Surplus Machine Tools are Suggested at New York Regional Meeting of National Machine Tool Builders' Association

BECAUSE the Government has requested that no conventions be held during the war emergency, the National Machine Tool Builders' Association has cancelled its regular spring meeting this year. Instead, local regional meetings have been held in six centers —Cincinnati, Chicago, Detroit, Cleveland, Worcester, and New York. At the latter meeting, held on May 15, important current problems of the industry were dealt with.

In his address, "The Machine Tool Picture Today," Joseph L. Trecker, president of the Association and executive vice-president of the Kearney & Trecker Corporation, Milwaukee, Wis., reviewed the problems that must be solved by the industry in the transition from war to peace. He called attention to the important part to be played by the industry in aiding the conversion to peacetime production. In spite of various steps taken by the Government and the War Production Board, the machine tool industry has thus far been unable to make any appreciable progress in the manufacture of critical reconversion machine tools, because of limitations placed on the industry by regulations dealing with priorities, materials, and man-power. However, within the last few weeks this situation has definitely changed for the better. Mr. Trecker emphasized the necessity of the machine tool industry being allowed from now on not only to retain, but to increase, its force of engineers, designers, and draftsmen, in order to meet the engineering demands on the industry.

He then referred to the Government-owned surplus machine tools. It had been assumed that in converting from war to peace, standard machine tools of various types might be easily obtainable from the Government surplus. Thus far, however, that situation has not materialized. "As near as we can determine," he said, "there is already an ample supply of surplus machine tools. The difficulty has been with the red tape involved in the purchase of such machine tools from the Government." The Machine Tool Builders' Association has recommended ways and means to the Government whereby surplus machine tools could be made available to manufacturers of peacetime products more easily.

Mr. Trecker also emphasized that industry, in the future, will be able to get a great deal more production out of the new types of machine tools available than can be had by using the obsolete machines still to be found in many American shops. The machine tool industry always gets more business, he noted, from the well equipped companies than from the poorly equipped plants, this doubtless being due to the fact that the poorly equipped company cannot afford to buy new machine tools because it does not operate profitably. Earnings available for substantial machine tool purchases accrue as a rule only in companies that are thoroughly modernized.

After reviewing the possibilities for foreign trade, the speaker called attention to the financial situation of machine tool builders who, through renegotiation proceedings, have been largely deprived of the reserves required to meet post-war conditions. He mentioned, however, that we have in Washington today what, in effect, may be called a new administration. From such indications as we have had thus far, this new administration is not concerned so much with the *theories* of high-level employment as with the *practical measures* whereby such employment can actually be brought into effect.

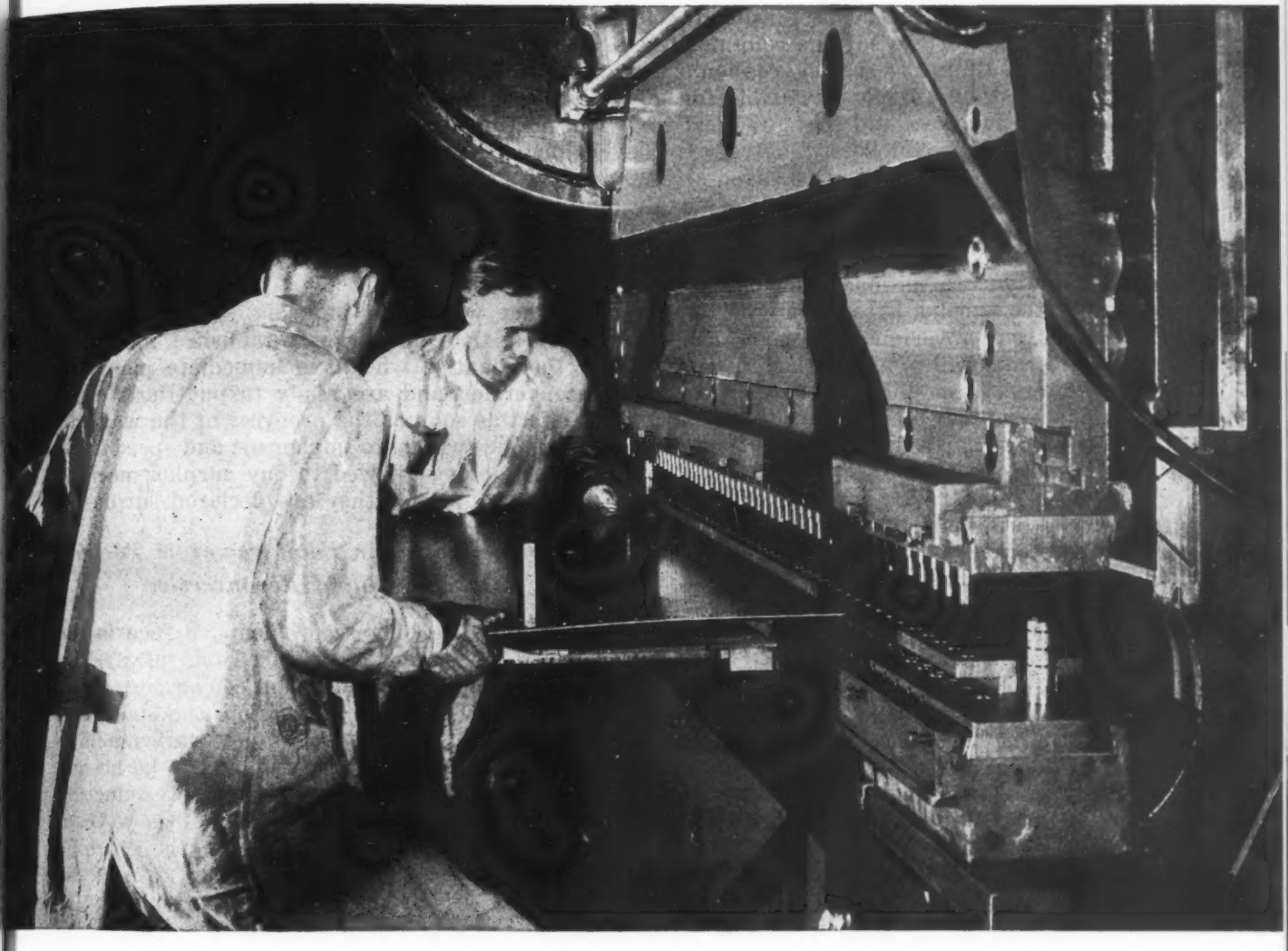
In conclusion, he referred to the Government control of industry necessary in time of war—controls that are not necessary or desirable in time of peace. Industrial managers should do everything in their power to be free and independent of Government regulation and control in time of peace. This, however, also involves that industry should not ask Government for any special protection. "If we want to get clear of Government," said the speaker, "if we don't want Government to control, we must also learn not to ask Government to help us."

Better Means for Disposal of Surplus Machine Tools are Needed

An address on the subject "Disposal of Surplus Machine Tools" was made by William P. Kirk, first vice-president of the Association and vice-president of Pratt & Whitney, Division

Punch it...

on a CINCINNATI PRESS BRAKE



Gang punching, as well as a great variety of forming, notching, combination notching and forming, trimming and punching . . . all are being done on Cincinnati Press Brakes.

Write for Catalog B-2, illustrating the possibilities of a Cincinnati Press Brake in your shop. Consult our Engineering Department on your punching and forming problems.

THE CINCINNATI SHAPER CO.

CINCINNATI OHIO U.S.A.

SHAPERS · SHEARS · BRAKES

Niles-Bement-Pond Co., West Hartford, Conn. In his address, Mr. Kirk made a strong plea for the retention by the armed forces of an ample share of Government-owned surplus machine tools. "If in future years," Mr. Kirk said, "this nation is going to remain in a position to defend itself quickly against any aggressor, it is imperative that we retain intact in this country a substantial supply of machine tools of the kinds needed for war production purposes."

After the Government has set aside for its own use that part of the surplus equipment required as an insurance against aggression, there still will be a sizable surplus available for disposal. On this point we find that practical considerations today run completely contrary to the provisions of the present surplus disposal law.

"Under the law as it stands now," said Mr. Kirk, "after the armed forces have decided what Government-owned machine tools they want to set aside for future national defense, the remainder of the surplus is to be offered to state governments, city governments, schools, colleges, penitentiaries, and all sorts of other institutions of a public or semi-public nature. When these institutions have had their pick, the remainder is to be offered to small businesses, as contrasted to large businesses.

"Furthermore, a returning veteran is to be given special preference. I quite agree that any returning veteran who wants to buy a machine tool to go into business for himself should get a chance to buy it; but how soon are these boys coming home and how many machine tools do you think they will want to buy? It does not make sense to hold up the whole disposal program on that account.

"So, under the law as it stands, after all these various priorities are taken care of, the manufacturers who have had practical experience over the years with machine tools and know how to put them to work are supposed to get a chance to buy what they want out of the final remaining surplus.

"How can any such system of so-called priorities possibly work to the benefit of anybody? There is one thing I want to make very clear at this point. This proposed method of disposal is not the fault of any of the governmental agencies. It is written into the law. If we appear to be making no proper headway on this problem, I do not think it is fair to blame the Disposal Board or the governmental agencies trying to operate under the terms of the law. Either the agencies operating under this law will have to interpret it in such a way as to make it practical or Congress will have to amend the law.

"What seems to be an intelligent and constructive procedure with respect to surplus machine tool disposal is as follows:

"The first step would be action by the armed forces—once they know what the Government owns—in deciding what machine tool facilities they wish to retain for stand-by equipment.

"The second step would be that the minute the Government finds it owns machine tools *not* needed for stand-by equipment, those machine tools should be put on sale, without reservations or priorities, and made immediately available to aid in the conversion of American industry from wartime to peacetime production.

"We do not need to worry about the schools, colleges, penitentiaries, or any of the other so-called local governmental authorities that may require machine tools, because the total that they could possibly absorb is only a drop in the bucket compared to the over-all total. There will be plenty left over for them.

"We do not need to worry about small businesses, or the returning veteran, because the total of the surplus will be so large that there will be plenty of machine tools still remaining available for them.

"What we should immediately be concerned about is that the larger established industries of the country, who have immediate plans for reconversion and are ready to put those plans in effect as soon as the progress of the war will permit, be enabled to implement and speed those plans by being allowed to buy surplus machine tools as rapidly as they are declared surplus.

Full-Scale Post-War Employment is Possible Only by Rapid Reconversion

"I think the biggest problem we face is the problem of employment. There is always an employment lag involved in conversion. The shorter the period of conversion, the shorter is the employment lag. Let us get every machine tool built for war that is not going to be needed for stand-by equipment into actual production in the plants of the country as fast as we can.

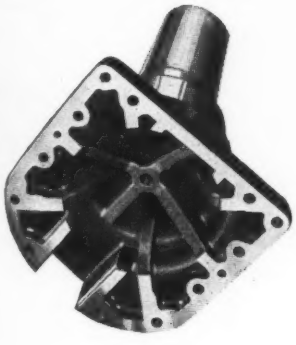
"This is the recommendation of the machine tool industry to the Government. This, you might say, is our platform on this whole question of Government-owned machine tools."

James Y. Scott, president of the Van Norman Co., Springfield, Mass., who is chairman of the Association's Committee on Government Relations, made a report on the work of this committee, while James A. Wright, former assistant director of the Tools Division of the War Production Board, presented a report from that Division.

The importance of sales and advertising plans during post-war years was emphasized in an address on that subject by E. Payson Blanchard, sales manager of the Bullard Co., Bridgeport, Conn. Mr. Blanchard called especial attention to the changed conditions that will face the industry shortly, in that instead of one main customer—the Government—the industry will now return to a highly competitive condition.

CONTINUOUS DRILLING HERE

The Machine moves from Job to Job!

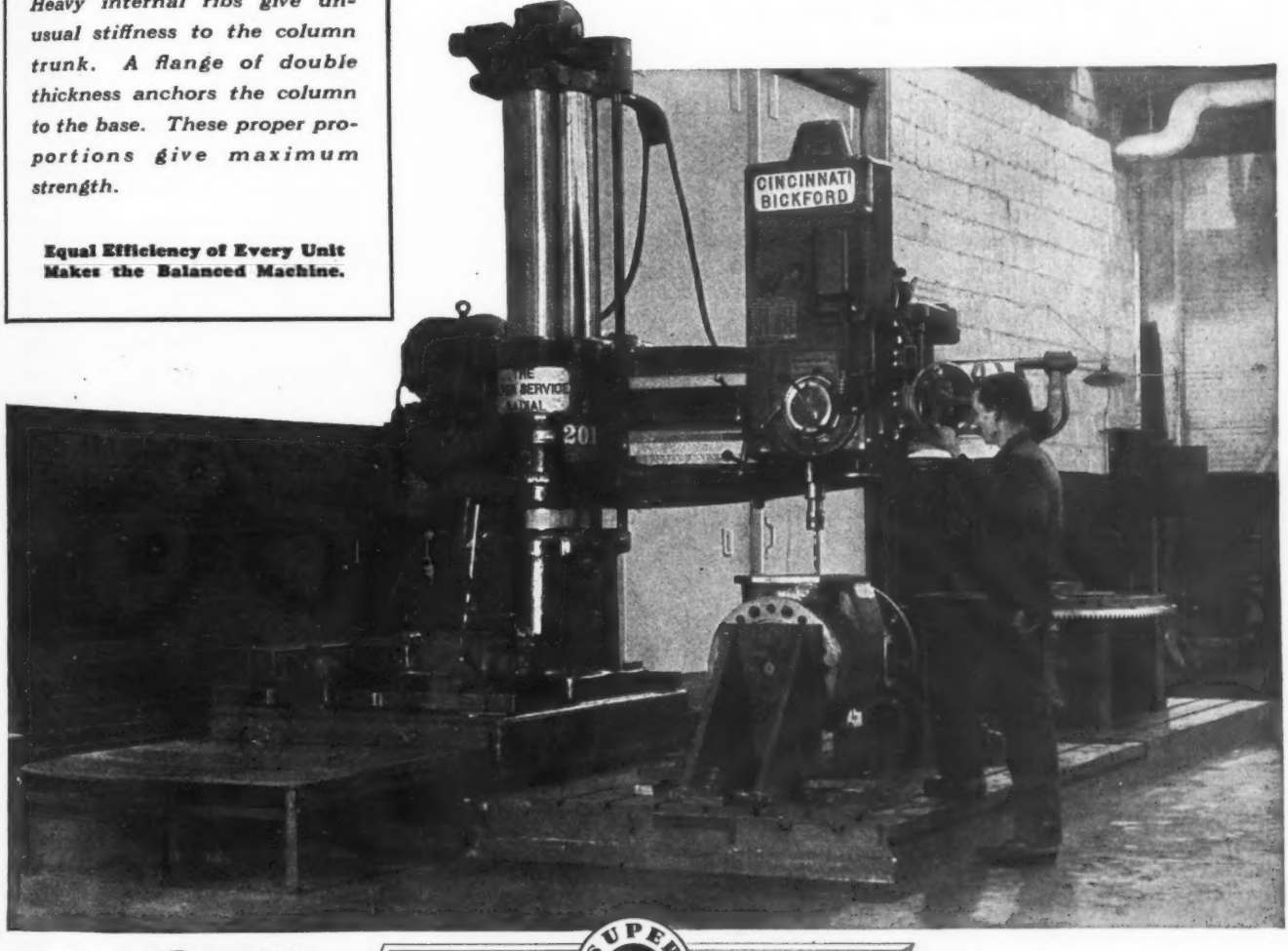


Heavy internal ribs give unusual stiffness to the column trunk. A flange of double thickness anchors the column to the base. These proper proportions give maximum strength.

Equal Efficiency of Every Unit Makes the Balanced Machine.

The low physical effort required of the operator on this Super Service Radial Drill and the accessibility of its controls contribute much to a maximum output. The use of the sliding base and a helper to set up work while the drill is in operation, give practically continuous drilling. Freedom from trouble and easy handling are necessities on production jobs.

Write for Bulletin R-24-M



ARMY E NAVY

RADIAL AND UPRIGHT SUPER SERVICE DRILLING MACHINES

THE CINCINNATI BICKFORD TOOL CO. **Cincinnati 9, Ohio U.S.A.**

Shop Equipment News

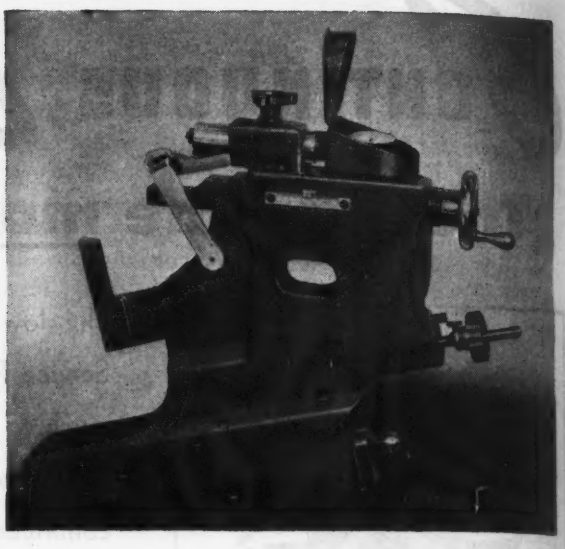


Fig. 2. Close-up View of Work-locator and Steadyrest of Machine Shown in Fig. 1

Machine Tools, Unit Mechanisms, Machine Parts, and Material-Handling Appliances Recently Placed on the Market

Norton Crankshaft Regrinding Machine

A new machine designed for regrinding pins and bearings on automotive, tractor, Diesel-engine, and truck-engine crankshafts has been brought out by the Norton Co., Worcester 6, Mass. This regrinding machine, shown in Fig. 1, has been developed for use in machine and jobbing shops. It is built in two sizes—22 by 72 and 24 by 84 inches. Both the headstock and the footstock have spindles with anti-friction bearings. Each of these spindles is equipped with an adjustable work-holder of a design that has been applied successfully to numerous machines of different sizes. These work-holders have a broader range than the conventional type chuck, and they have been especially designed and built to retain their accuracy indefinitely.

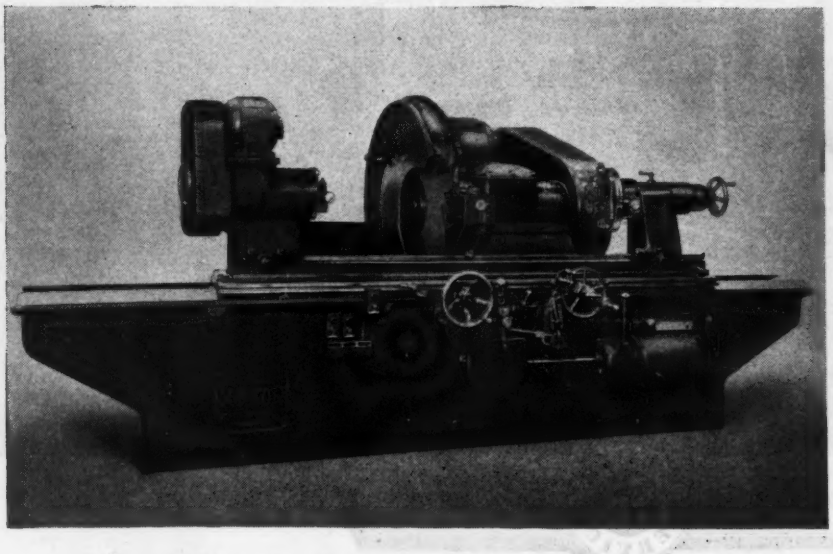


Fig. 1. Machine Developed by the Norton Co. for Regrinding Automotive and Diesel-engine Crankshaft Pins and Bearings

In using this machine for grinding crankpins, the shaft is held by the end main bearings, which affords the greatest possible rigidity and makes possible a high degree of accuracy. Compensation for any wear occurring in the work-holders over a period of years is readily accomplished by means of an adjustment that is provided for this purpose.

The work-locator and steadyrest shown in the close-up view, Fig. 2, are designed to indicate the position of the crankpin, both for throw and plane location, and to show the amount of adjustment required. The handwheel on the steadyrest, graduated in thousandths of an inch, is used to make the necessary corrections for out-of-plane conditions. Adjustments for throw are similarly made with graduated screws in the work-holders. This indicator can also be used as a grinding gage, to indicate size compared to a pre-established standard or to show the amount of stock being removed.

The machine is so designed that both crankpins and bearings can be ground with a minimum expenditure of time in making setups between operations. A quick change-over can be made from one size of crankshaft to another.—51

To obtain additional information on equipment described on this page, see lower part of page 182.

SIDNEY *Precision* LATHES

● The Sidney Lathe Bed shown is provided with four longitudinal walls with cross girts at 12 inch intervals—assuring accuracy under the heaviest service—resisting deflections and twisting strains.

Actual tests have proved this design far superior to the two wall construction.

This type of bed provides adequate support to the various units of the lathe and is essential to eliminate vibration and assure accuracy in meeting present day demands.

The bed is cast of semi-steel nickel mixture which gives a close grained, hard bearing surface to the ways which are provided with force feed lubrication and protected with Neoprene wipers.

The SIDNEY MACHINE TOOL COMPANY
Builders of Precision Machinery
SIDNEY • OHIO
ESTABLISHED 1904

New Control Cab for Traveling Cranes

A self-contained control cab for overhead traveling cranes, in which radical innovations in design have been incorporated, has been developed by the Cleveland Crane & Engineering Co., 1157 E. 283rd St., Wickliffe, Ohio. Simplified controls, which can be easily operated in the sitting position, are an outstanding feature of this new equipment. The cab can be furnished with any new crane employing magnetic control, and can be applied to existing cranes of any make.

The enclosing panels of transparent material extend to the floor, and thus permit maximum vision in every direction. The new plastic material from which the panels are made is shatter-proof and impervious to certain gases that may be injurious to glass. Hoist and trolley switches are attached to the right and left arms of the chair. The bridge switch is on the floor and controlled with the right foot. With this arrangement, there is a definite control job for each hand and each foot, only one function being under the control of each of these members.

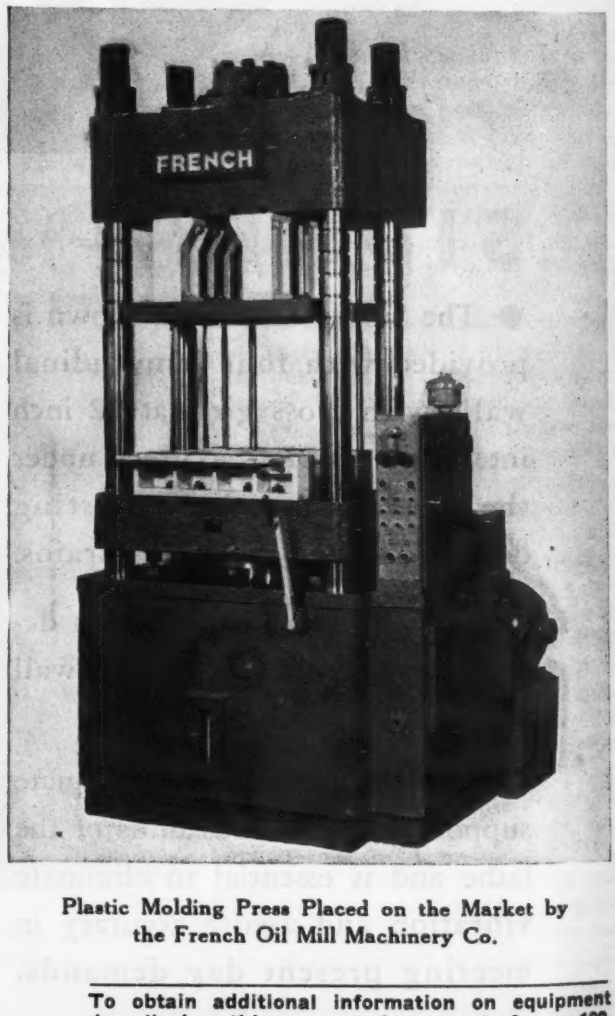
An air-cooled air-conditioning unit provides fresh air at any normal temperature desired, and furnishes protection against objectionable gases, dust, and fumes. The unit attached to the cab illustrated is designed for use where temperatures do not exceed 140 degrees. The traveling platform shown just to the right of the cab serves both as a vestibule to the cab and as a means for easy access to the entire exterior side of the window for cleaning purposes, it being possible to traverse or swing this platform around the circular base of the cab. Safety locks on both the platform and cab door prevent operation of either when the platform is not definitely located in the proper safe position. The cab is 6 feet 6 inches high by 4 feet 6 inches in diameter, and is equipped with Electric Controller & Mfg. Co.'s master switches and Lintern Aire-Rectifiers. ——52

Self-Contained Plastic Molding Press

A combination compression and transfer molding press, comprising a self-contained unit with hydraulic pumping equipment built into the bed of the machine, has been placed on the market by the French Oil Mill Machinery Co., Piqua, Ohio. Each unit of this press is complete with a fully automatic cycle controller covering various types of molding. The changing of timing intervals from one type of molding to another can be made with practically no lost time with this arrangement.

These fast acting presses are being used in connection with high-frequency preheating units to obtain maximum production speeds. The idle closing speed is at the rate of 300 inches per minute. Power requirements are kept to a minimum, the 100-ton press being operated by a 5-H.P. motor, and the 200-ton press by a 7 1/2-H.P. motor. ——53

Full-vision, Enclosed, Air-conditioned Cab for Traveling Cranes with Magnetic Control



Plastic Molding Press Placed on the Market by the French Oil Mill Machinery Co.

To obtain additional information on equipment described on this page, see lower part of page 182.

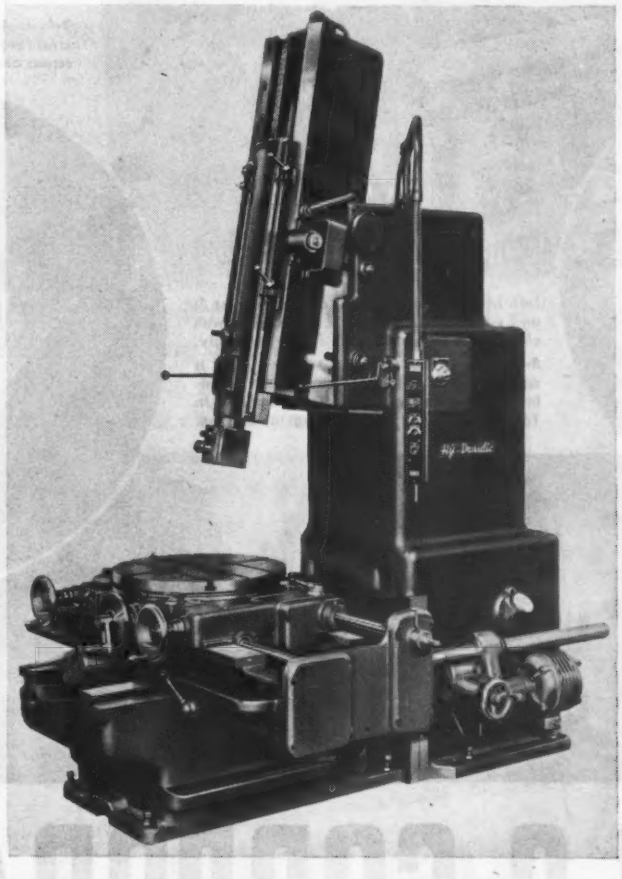
"Hy-Draulic" Slotting Machines

The new "Hy-Draulic" slotter, brought out by the Rockford Machine Tool Co., 2498 Kishwaukee St., Rockford, Ill., has a stroke of 20 inches and possesses all the advantages found in the smaller 12-inch slotter, which it resembles in practically all details except stroke length and height. The new machine has both manual and hydraulic longitudinal and transverse feeds, with power rapid traverse, and manual and hydraulic rotary feeds to the table, also with power rapid traverse. Micrometer dials graduated in thousandths of an inch for longitudinal and transverse feeds are provided, and the table is graduated for angular setting through a complete circle, or 360 degrees.

Control levers and push-buttons are conveniently located. Rotating parts are protected by suitable guards, and the ways are protected from grit, dirt, and chips by wipers. Provisions are also made for taking up wear. This 20-inch stroke machine has a space of 24 inches under the ram guide and an adjustment of 19 inches for positioning the ram on the hydraulic driver. Both the 12- and 20-inch machines will cut slots to the center of a 48-inch circle, and can be adjusted for any desired cutting speed between 10 and 60 feet a minute. The return speed is at the rate of 1.67 times the cutting speed.

Tools of any size up to 7/8 inch by 2 inches can be used. The exact movements of the table are shown by micrometer dials graduated in thousandths of an inch. The ram is mounted in an independent housing which permits pivoting or tilting forward at the bottom to any angle up to 10 degrees from the vertical. Heavy locking bolts are provided for clamping the ram in the required tilted position.

The table has a longitudinal travel of 26 inches and a transverse travel of 26 inches. The maximum distance from the table to the lower face of the tool-head is 30 inches for the 12-inch stroke machine, and 40 inches for the 20-inch stroke machine; the minimum distance is 1/4 inch for both machines. Both machines have tables 28 inches in diameter with T-slots 11/16 inch wide. Both machines require a floor space of 86 by 112 inches. The shipping weights of the two machines, with electrical equipment, are 13,000 and 14,000 pounds.—54



Rockford "Hy-Draulic" Slotting Machine with 20-inch Stroke

Electrode for Welding Bronze, Brass, and Copper

An electrode for arc-welding bronze, brass, and copper, known as "EutecTrode 28," has been placed on the market by the Eutectic Welding Alloys Co., 40 Worth St., New York 13, N. Y. The new electrode is a special bronze alloy with a flux coating that makes it suitable for use with either alternating or direct current. It is said that this electrode will deposit a dense and tough metal of a color to match most types of bronze. It can be used for welding copper and brass or for joining these metals to steel, cast iron, or nickel alloys, and for overlaying steel or cast iron to provide a good bearing surface.—55

Liberty Double-Housing and Open-Side Planers

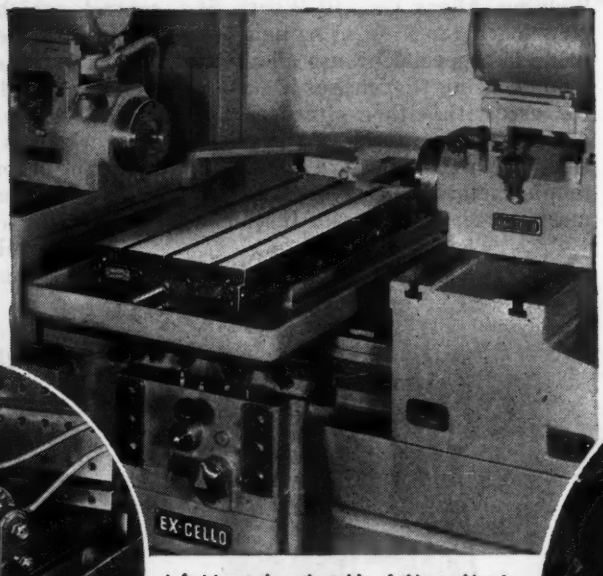
Double-housing planers in sizes from 36 up to 120 inches, and open-side planers in sizes from 36 up to 96 inches, in which new features have been incorporated, are being built by Liberty Planers, Inc., 1007 Weller Ave., Hamilton, Ohio. These machines include such features as dual control with levers mounted on both the right- and left-hand sides of the machines. The rail and heads can be operated electrically through the pendent push-button control, which can be swung into any position either to the right or the left. This control can also be swung around in back of the housing for use when the operator sets up work on a second or dual table while the other table is in operation.

Push-button control is provided for elevating and lowering the cross-rail, rapid traverse of heads and tool-slides in all directions, automatic starting, stopping, and "inching" in both directions. The rail is automatically clamped by a motorized unit as soon as the finger is removed from the rail control button. This unit has an equalizing plate which distributes the same amount of pressure on each housing. The rail is independent of the side-heads, and has its own individual motor for the power-feed rapid traverse of the rail-head and for elevating and lowering the cross-rail.

Feeding and rapid traverse of the heads are accomplished by a friction drive which serves as a safety feature in case the heads are accidentally run against each other or against a stationary piece of work. This safety feature is also provided for the side-heads, which are independent units with their own individual motors. The side-heads are

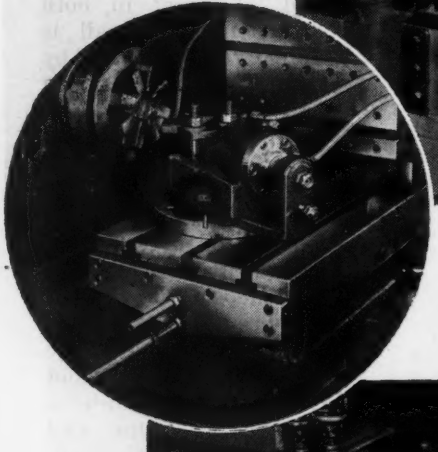
To obtain additional information on equipment described on this page, see lower part of page 182.

Flexibility IS THE



For finishing operations on job lots in all shapes and sizes, the Ex-Cell-O Precision Boring machine, shown at left, has proven ideal in a great many shops.

Below: An Ex-Cell-O standard adjustable cross feed slide is arranged with positive stop screws and an independent hydraulic panel.

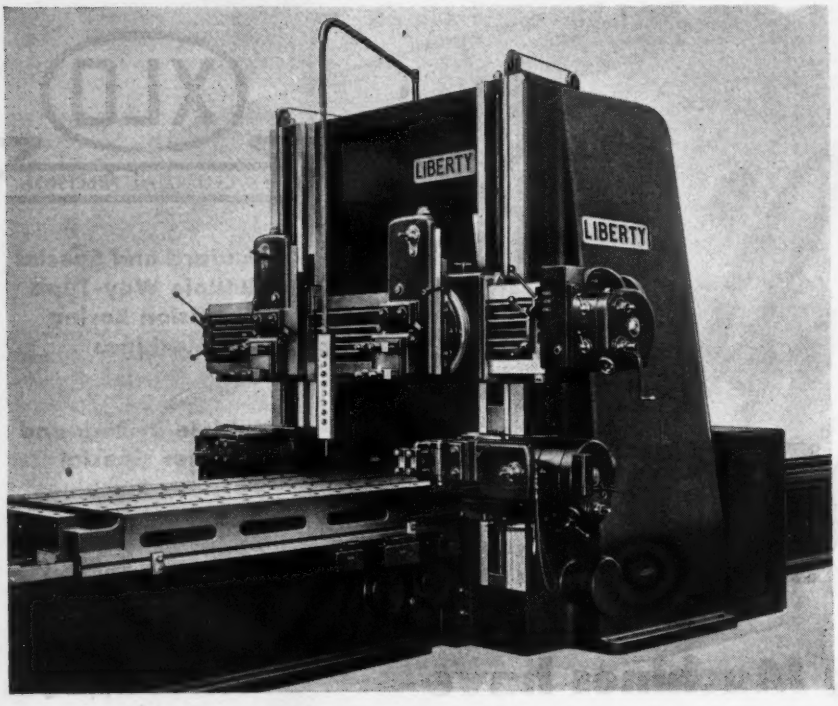


Left: Mounted on the table of this machine is an Ex-Cell-O adjustable cross feed slide with chip pan. This feature adds further versatility.

Below: Note that Ex-Cell-O boring head is mounted on a calibrated swivel-type mounting so that it may be set at any angle up to 16 degrees right or left for boring taper holes.

Shown at left are additional available items such as a three-jaw chuck for turning or boring, and a micrometer adjustable boring bar block.

EX-CELL-O CORPORATION



Liberty 60-inch Double-housing Planer of Improved Design

located in parallel alignment with the rail-head to permit all tools to be located in the same plane. This arrangement makes it unnecessary to lengthen the stroke when cutting simultaneously with tools held in the rail- and side-heads.

Forced-feed lubrication to the V-ways of the bed and table and the bearings in the bed is provided by an individual motorized pump. Pneumatic tool-lifters are furnished for all heads. The complete feed-box mechanism includes all safety features, the clutches being interlocked for operations such as feeding, rapid traverse, or elevating.

These machines can be furnished with cutting and return speeds up to 240 feet per minute or higher if required, and down to 4 to 5 feet per minute for use in cutting extra hard materials. 56

Master Optical Center-Locator

The Master Specialty Co., 5700 Cedar Ave., Minneapolis 7, Minn., has brought out an optical center-locator set designed to assist machinists and toolmakers in drilling work that requires very accurate alignment of the holes with centers located by intersecting lay-out lines scribed on the surface to be drilled. As shown in Fig. 1, this locator set consists of a magnifier with a small etched reference circle in its base ring *A*, and two powerful magnifying lenses in the upper ring *B*, which can be adjusted to enable the reference circle to be accurately centered over the intersecting point of the scribed lay-out lines; sixteen drill bushings for drills ranging from 3/64 to 3/8 inch in diameter; and a holding fixture *C* with clamping yoke *D* for holding either the magnifier or a drill bushing in the V-notch, as indicated in Fig. 2.

After the work has been carefully laid out by means of a vernier height gage and a surface plate, the compound magnifier is clamped in the holding fixture by tightening the knurled head *E* of the clamping yoke. The magnifier, clamped in the holder, is then moved slowly over the surface of the work to be drilled until the reference circle etched on the sight glass is exactly centered over the intersecting lay-out lines which position the drill. The holder is then clamped to the work, the magnifier removed, and a drill bushing of the correct size clamped in its place.

With this instrument, it is claimed that holes can be easily located and drilled to an accuracy of 0.001 inch. The work is usually placed on parallel bars to facilitate alignment of the bushing and the drill. The optical center-locator also provides an accurate means for center-punching, using the drill bushing as a guide for the close-fitting punch. 57

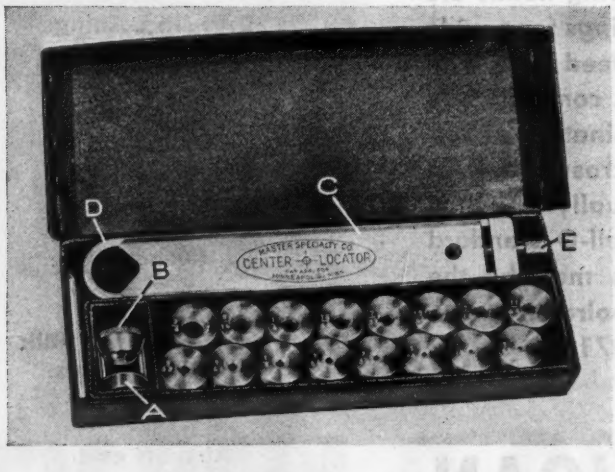


Fig. 1. Master Optical Center-locator Set for Use in Drilling Accurately Laid-out Holes

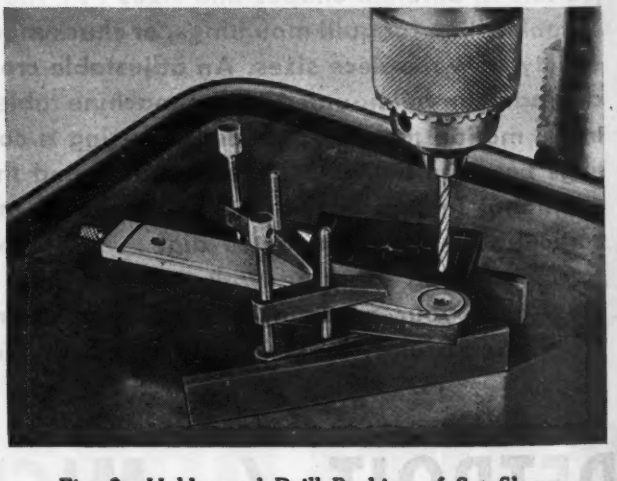


Fig. 2. Holder and Drill Bushing of Set Shown in Fig. 1 Clamped to Work for Drilling Hole

To obtain additional information on equipment described on this page, see lower part of page 182.

How Much is .000,000,25"?

Not even a laboratory microscope could discern it! But this new machine is so sensitive to vibrations produced by unbalance that it can *feel* and *indicate* a workpiece bearing displacement as minute as one four-millionth of an inch—¼ of a micro-inch!

THE NEW GISHOLT DYNETRIC* MICRO-BALANCER

Here precision is carried to a degree never before known in the field of dynamic balancing. Here a displacement of .000,000,25" due to unbalance vibrations causes the indicating needle to move approximately one-half inch.

The Micro-Balancer was designed especially for balancing parts at any speed up to 36,000 r.p.m.

Where desired, the workpiece can be driven by its own source of power. For example, an air-driven gyro rotor can be driven by an air jet. Or a high-speed, high-frequency motor can be balanced in its own housing and running under its own normal power source.

The new Dynetric Micro-Balancer is another example of Gisholt's ability to balance any rotating part. This unquestioned leadership is at your command.

**A development of Westinghouse Research Laboratories, and Industrial Electronics Division.*

GISHOLT MACHINE COMPANY
1209 *East Washington Avenue • Madison 3, Wisconsin*

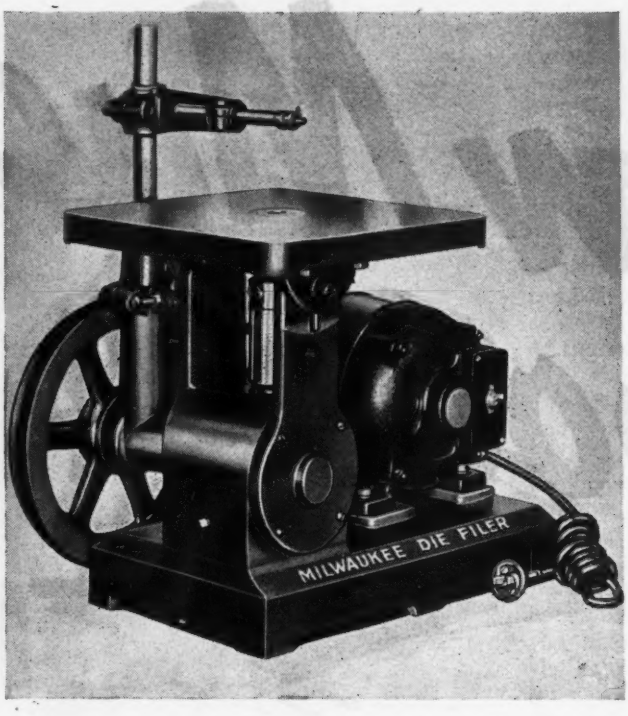
Look Ahead... Keep Ahead... With Gisholt

THE DYNETRIC MICRO-BALANCER *is available in two basic models: Type H for locating and measuring unbalance in parts supported with rotational axis in a horizontal plane, and Type V—for workpieces supported vertically. Literature on request—specify Form 1099.*

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES • SPECIAL MACHINES

Milwaukee Bench Type Die-Filing Machine

The bench type, reciprocating, die-filing machine known as the "Atlas" has recently undergone improvements designed to simplify operation and adjustment, and has been renamed the Milwaukee die filer by its manufacturer, the Milwaukee Chaplet & Mfg. Co., Milwaukee, Wis. This filer is being used extensively in tool, die, and machine shops for a wide variety of filing, sawing, and lapping operations. It is also used in foundries and metal - working plants for fast precision trimming of small castings, stampings, forgings, and other metal parts.



Milwaukee Bench Type Die-filing Machine

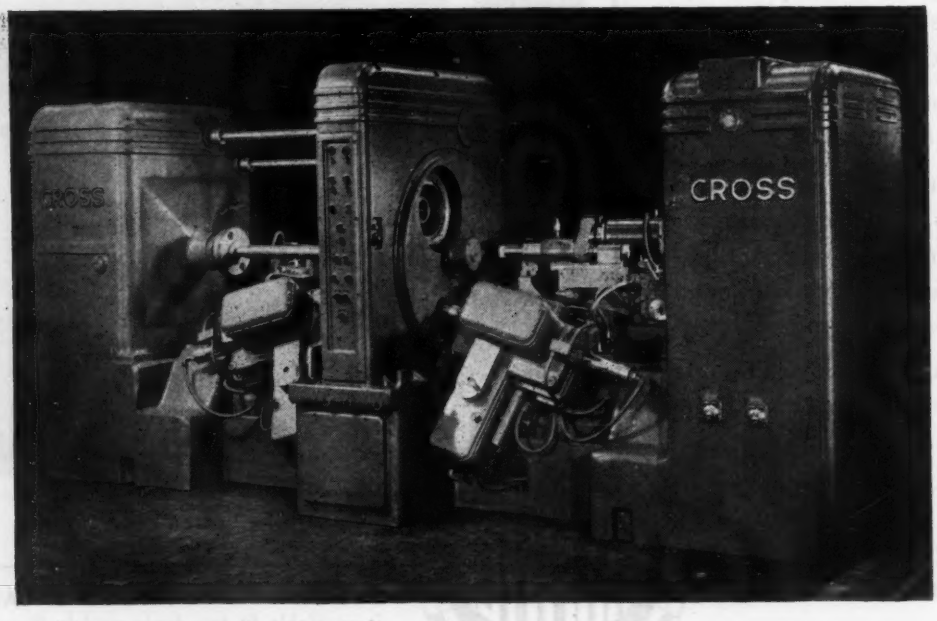
One of the advantages of this machine in tool and die making work is the ease and speed of inspection it permits when used for internal filing or sawing. The file support unit or saw over-arm can be swung out of the way instantly to enable the operator to remove the die-block quickly for frequent checking, and return it to the exact original setting.

Only a few minutes is required to substitute the saw over-arm for the roller file support arm. Hold-down fingers can be quickly attached directly to the saw over-arm. Extremely accurate work can be performed with the saw attachment, so that very little metal need be left for subsequent filing. The machine is used extensively for lapping operations, lapping sticks being substituted for files or saws by means of a simply constructed lapping-stick holder which can be readily inserted in the chuck.

The working surface of the table can be tilted 12 degrees in two directions to suit the operator's convenience. An improved type of chuck with movable hardened jaws for holding files, saws, or lapping sticks, which are mounted in a metal holder, is supplied. The rated speed is 325 to 450 strokes per minute, the stroke length being 1 1/2 inches. The machine is regularly equipped with a standard 110-volt, 60-cycle alternating current electric motor, file roller support, and saw over-arm. 58

Cross Multiple-Spindle Machine for Grinding and Honing Taper Bearings in Wheel Hubs

The four-spindle special machine shown in the accompanying illustration was brought out recently by the Cross Co., Detroit 7, Mich., for use in simultaneously grinding and honing two hardened taper bearings that are integrally cast in automotive wheel hubs. This new grinding and honing process eliminates the practice of pressing separate bearing cups into the wheel hubs, and is claimed to produce at lower unit cost a bearing that is more accurately centered.



Special Machine Built by the Cross Co. for Grinding and Honing Taper Bearings in Automotive Wheel Hubs

The machine has a three - station, trunnion type indexing work-fixture mounted between two opposed grinding heads at the first station and between two opposed honing heads at the second station. The third station is used for loading and unloading the work. All elements of the machine are hydraulically actuated and automatically controlled by electric push-buttons.

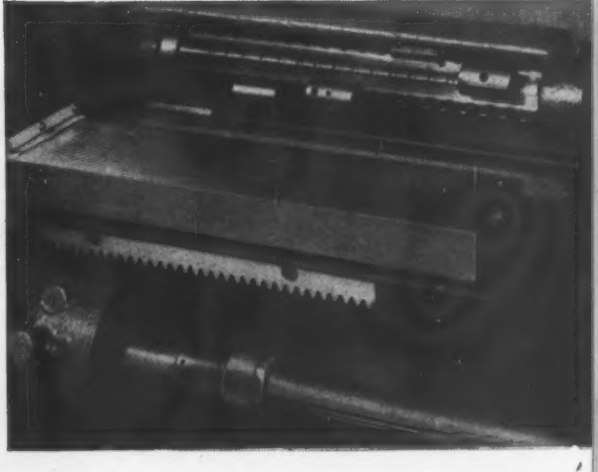
To obtain additional information on equipment described on this page, see lower part of page 182.

where the "HARD" way

is the RIGHT way!

There is no substitute for *hard* steel on the ways of a turret lathe. That's why Gisholt does it *right*... makes its bedways of steel, hardened to 64-66 on the Rockwell C scale.

That's why Gisholt's ways can't be battered by heavy work or scored by hard, tough chips. Straddle-keyed their entire length, bolted to bedways from the under side, and finish-ground in exact alignment with the spindle, Gisholt's hardened-steel ways provide bearing surfaces that are virtually wear-proof. They insure the high standard of accuracy for which Gisholt is known—and maintain it through long years of service.



Gisholt's thick, block-type ways are hardened on all surfaces: (1) top *to support weight of carriages and cutting pressure of tools,* (2) both sides *for alignment and gibbing, and* (3) *for* bottom *gibs and clamps. Automatic pressure lubrication eliminates any tendency to wear, even in areas of heaviest carriage travel.*

GISHOLT MACHINE COMPANY

1209 *East Washington Ave.* • *Madison 3, Wisconsin*

Look Ahead . . . Keep Ahead . . . With Gisholt Improvements in Metal Turning

GISHOLT

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES • SPECIAL MACHINES

The automatic cycle is arranged to index the work into position at each station. While the grinding heads rough-grind, retract, dress the wheel, and finish-grind both taper bearings in opposite ends of the hub, the previously ground bearings in another hub are honed. Grinding coolant is automatically flushed from the hub as it is indexed to the honing station. The accuracy of the surface finish is 3 micro-inches, and the production rate is 50 hubs per hour. ——59

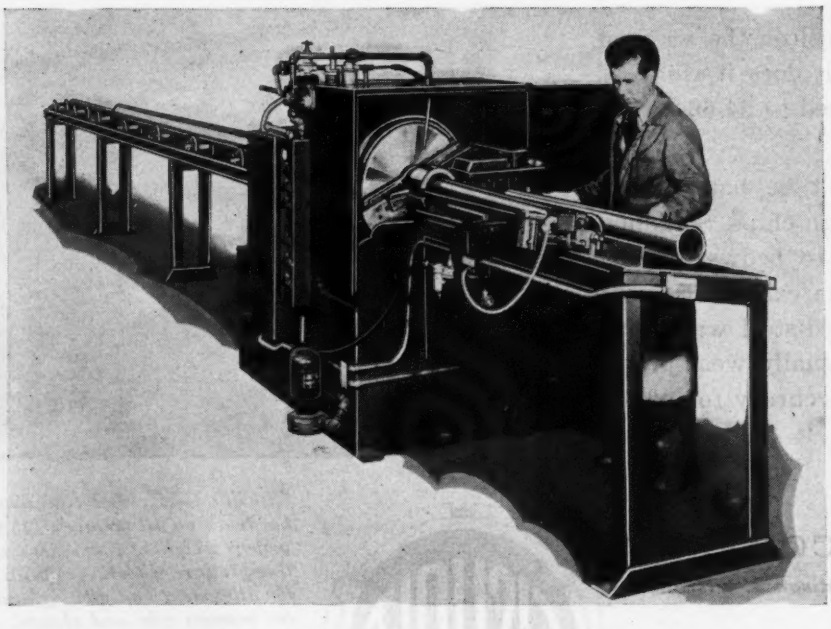
Pines Automatic Rotary Cut-Off Machine

The Pines Engineering Co., Inc., 220 S. Highland, Aurora, Ill., has developed a completely automatic rotary type cut-off machine which has a capacity for handling tubing having outside diameters ranging from 3/4 inch to 5 inches and piping up to a maximum size of 4 inches. This machine is equipped with a hollow spindle through which the tubing is fed into a self-centering hydraulically actuated automatic chuck. The cutters are held in two tool-holders mounted on the spindle faceplate.

Pressing a button starts the automatic machine cycle. The tube is advanced by power feed-rolls until it strikes an air operated "target stop," which positions the end of the tubing for cutting off to the correct length. The chuck then closes, the power feed-rolls are stopped, and the "target stop" is pulled clear of the tube end. Next the tools are advanced simultaneously by cams until they strike the tubing, when a speed control valve operates to regulate the feed of the tools while they are cutting through the tube wall. An adjustable limit switch reverses the tool feed after the cut is completed.

The chuck is next opened and the tube fed through the spindle, pushing out the cut-off piece, which rolls down the table and strikes a "flag switch," thus bringing the automatic "target stop" back into the operating position.

This machine will cut off mild steel tubing having an outside diameter of 5 inches and a wall thickness of 1/4 inch at the rate of 200 pieces per hour or tubing having an outside diameter of 2 inches and a wall thickness of 1/8 inch at the rate of 400 pieces per hour. —— 60



Automatic Tube and Pipe Cutting-off Machine Developed by the Pines Engineering Co.

Narragansett Hydrostatic Tester for Tubes and Cylinders

The Narragansett Machine Co., 45 Baker St., Providence, R. I., has developed a "Hydro-Tester" for testing tubes and cylinders hydrostatically, which is claimed to be extremely efficient and rapid in operation. This new Series 100-5 hydrostatic tester was designed primarily for testing 5-inch rocket tubes, but it can be furnished in capacities suitable for testing tubes and cylinders of almost any size and shape. It is motor-operated through suitable reduction gears with enclosed automatic switches. Testing is accomplished by introducing water at city pressure of about 80 pounds per square inch into the cylinder under test while it is held between two fabricated, specially designed, steel adapter plates which seal both ends of the cylinder.

Hydrostatic Tester for Tubes and Cylinders

Hydrostatic pressures up to 6000 pounds per square inch are produced by an air cylinder. The air-cylinder piston extends up and through the bottom of the machine into the water-filled cylinder or tube to be tested, causing controlled and measured displacement up to the hydrostatic pressure desired. All working parts are enclosed in a metal cabinet for protection of the worker. It is claimed that cylinders can be tested at the rate of seventy to eighty per hour. All functions, including operation of the ram, introduction of water, movement of the piston, and release of the water, are under push-button control. ——61

To obtain additional information on equipment described on this page, see lower part of page 182.

Whether you turn out fighting equipment for Uncle Sam or are re-tooling for peacetime production, you'll find Chicago Wheels just what you've been looking for to produce better, smoother finishes. The widest range of types, abrasives and bonds — wheels to do any job of grinding so accurately the finish can be measured in micro inches — rubber wheels for polishing or precision cut-off work.

You get the results of half a century of invention, tests and improvements from our modern research laboratory. And, this same laboratory is open to you—tell us about any grinding problem you have and our engineers will tell you how best to whip it.

GRINDING WHEELS up to 3" in diameter in various bonds, including the new FV, the bond with a pedigree.

MOUNTED WHEELS in every practical shape, grain and grade, each firmly mounted on a steel shank.

TRY A TEST WHEEL — Write us what material you have to finish and size wheel you'd like. We'll send one promptly.

Write for Catalog of complete Chicago Line

CHICAGO WHEEL & MFG. CO.

1101 West Monroe Street Dept. MR. Chicago 7, Illinois

*Half a century of specialization has established our reputation as the small wheel people of the abrasive industry.

CHICAGO GRINDING WHEELS AND MOUNTED WHEELS

MR-6

Send Catalog. Interested in ☐ Mounted Wheels ☐ Grinding Wheels. ☐ Send Test Wheel. Size.....

Name.....

Address.....

Hager Carbide Tool Grinder

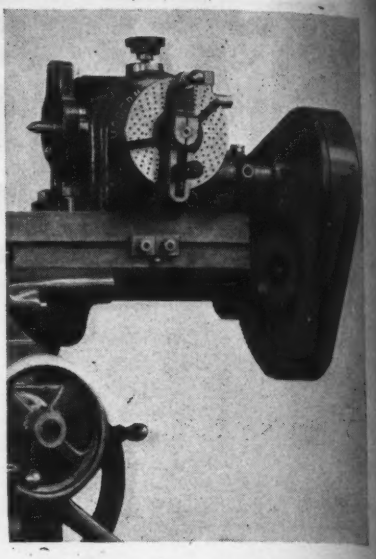
A machine designed to speed up the precision grinding of carbide tools and to eliminate the need for employing highly skilled operators for this work has just been developed by E. F. Hager & Son, 98-02 217th Lane, Queens Village 9, L. I., N. Y. This machine is equipped to precision-grind or lap to a high degree of accuracy carbide cutting tools for lathes and screw machines, as well as inserted carbide-tipped tool bits for milling cutters. It is claimed that all angular tool faces can be accurately rough- and finish-ground or lapped on the diamond wheels by simple mechanical settings in less time than is ordinarily required for rough-grinding alone on hand tool grinders.

The most important feature of the Hager carbide tool grinder is that it eliminates all guesswork and free-hand operation. Once the tool is clamped in the easily adjustable vise-like tool-holder and properly set by built-in protractors for grinding the cutting edge with the required clearance angles, a uniform reciprocating action of the tool across the diamond wheel will assure a keen edge and a straight face on the tool. After the tool is locked in the desired position, the tool-holder can be slid from the rough-grinding wheel to the finish-grinding wheel without removing the tool from the machine or changing the angular settings. This arrangement provides for very accurate finish-grinding, which permits duplicate tools to be ground with sufficient accuracy to insure interchangeability. ——— 62

Universal Dividing Head

Modern Tool Works, Ltd., 69 Montcalm Ave., Toronto, Ontario, Canada, has brought out a universal dividing head for milling machines that is especially designed to maintain a high degree of accuracy when employed for spiral and helical milling operations on continuous production work. It is well suited for use in the manufacture of helical milling cutters and reamers.

The rigid optical inspection methods used in checking these dividing heads is said to guarantee circular spacing that is accurate within plus or minus 1 minute of arc at any setting. The dividing head shown in the accompanying illustration is built for mounting on the table of a universal milling machine, and is furnished with change-gears for spiral or helical milling that can be mounted in the take-off gear-box at the right of the table.



Dividing Head Designed to Give Long Continuous Service on Helical Milling Work

The "Cone-Drive" gearing made for these dividing heads by the Michigan Tool Co., Detroit, Mich., is designed to minimize wear on the teeth of the gear and pinion by reducing the unit loading. Another advantage claimed for this drive is the tendency of the meshing gears to carry the lubricant into the spaces between the teeth. ——— 63

Fig. 1. Carbide Tool Grinder Brought out by E. F. Hager & Son

Fig. 2. Close-up View of Tool Grinding Set-up on Machine Shown in Fig. 1

To obtain additional information on equipment described on this page, see lower part of page 182.

BAR-STOCK TO FINISHED PART

18-8 STAINLESS... 30% BETTER TOOL LIFE

SUNICUT...

Keeps Small Tools Working Longer, Produces Better Finish

An eastern manufacturer was turning out 18-8 stainless-steel eye-terminals for the Navy on a Simmons Micro-Speed No. 2 Turret Lathe . . . cut-off and shape, rough turn, form, spot drill, drill, ream, and circular-form turn.

The material was 1" round annealed bar-stock, cut at a speed of 130 s.f.p.m. and spindle speed of 500 r.p.m. All tools were high-speed steel, except the rough turn and form tools which were carbide-tipped.

Short tool life . . . and poor finish, which necessitated hand-filing, were a problem, until a Sun Cutting Oil Engineer was called in, studied the different operations, and recommended Sunicut. With this transparent, sulphurized cutting lubricant, tool life has increased 25% to 30%; finish is now excellent; the hand-filing has been eliminated. Reamers now last 600 hours; forming tools average 280 hours.

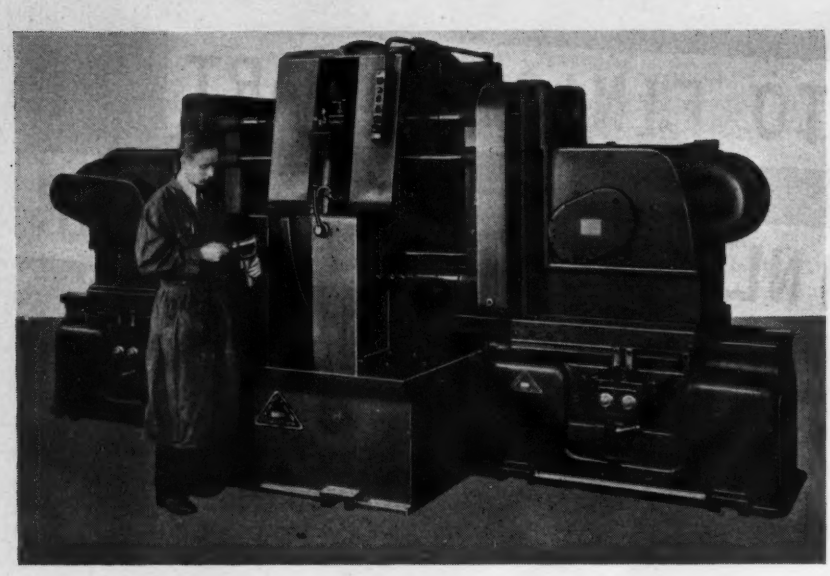
If you're troubled by frequent set-up changes, poor finish, or other metal-cutting problems, talk with the Sun Cutting Oil Engineer near you, or write to . . .

SUN OIL COMPANY • ***Philadelphia 3, Pa.***

Sponsors of the Sunoco News Voice of the Air—Lowell Thomas

SUNOCO **SUN INDUSTRIAL PRODUCTS**

OILS FOR AMERICAN INDUSTRY



Special Two-way, Trunnion Type Machine Built by LeMaire Tool & Mfg. Co., for Drilling and Reaming Universal Joint Yokes

LeMaire Two-Way Machine for Drilling and Reaming Universal Joint Yokes

A special two-way, trunnion type machine for drilling, chamfering, and reaming yokes for universal joints has been built by the LeMaire Tool & Mfg. Co., 2657 S. Telegraph Road, Dearborn, Mich. This machine will accommodate yokes ranging in size from 7/8 inch to 1 1/2 inches in diameter. It is designed to obtain line-reaming accuracy and higher production by reaming from opposite sides of the work simultaneously.

The reamers are driven by a special quill type spindle built into the trunnion, power being transmitted from the multiple head through a flexible drive. The manually operated six-station trunnion is mounted on a fabricated base on which two standard LeMaire self-contained slide type hydraulic units are assembled. Change-gears provide various spindle speeds for the five-spindle drilling heads.

The cycle of operations consists of loading and unloading the work at the first station, spot-drilling and chamfering at the second, rough-drilling at the third, finish-drilling at the fourth, semi finish-reaming at the fifth, and finish-reaming at the sixth station. 64

Hanchett Electromagnetic Chuck

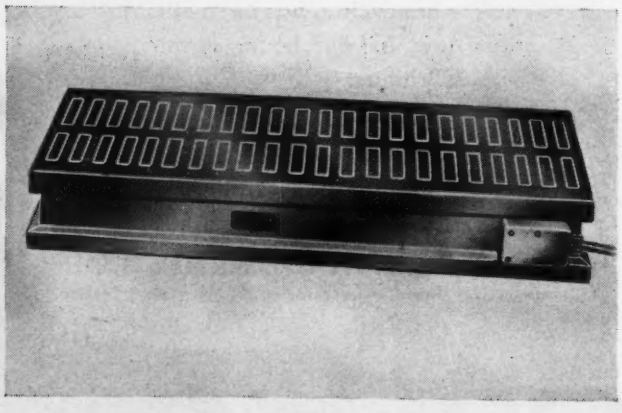
The Hanchett Mfg. Co., Big Rapids, Mich., has placed on the market a new type of electromagnetic chuck featuring a patented "Hermeti-Coil" which is claimed to be absolutely waterproof and shockproof. The coils themselves are sealed in air-tight plastic cases, and the lead wires are carried from each coil through air-tight plastic containers, making each coil a self-contained unit.

The faceplate of the new chuck can be detached and replaced as a unit when it becomes worn, thus saving the cost of an entirely new chuck. This construction is also said to insure an air-tight chuck body. The chuck is especially designed to withstand tremendous external pressures, especially where coolants, water, or oil are used. These chucks are made from low-carbon steel to obtain the maximum magnetic holding power. Chucks of the new design are made in many sizes and in rotary, rectangular, and revolving types. 65

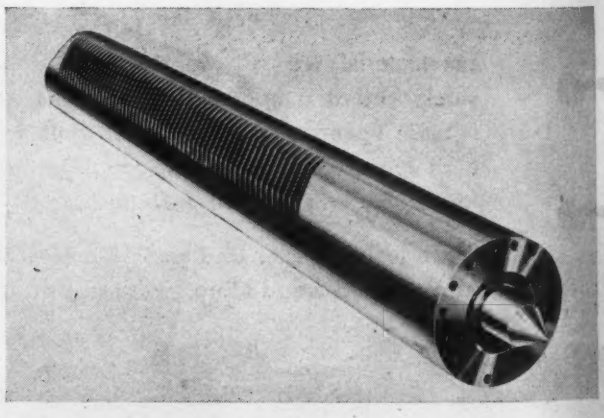
Pope Live-Center Tailstock Spindle

The Pope Machinery Corporation, 261 River St., Haverhill, Mass., has brought out a live-center tailstock equipped with preloaded SKF double-row roller bearings which carry the radial load imposed by the weight of the work. Preloaded thrust bearings in special mountings provide automatic compensation for axial elongation of the work due to heat expansion. It is claimed that this precision compensating live-center tailstock spindle provides for this axial movement without losing any of the accurate centering support furnished by the preloaded radial bearings.

With the new tailstock, the operator has only to set up the work and adjust the center; no further ad-

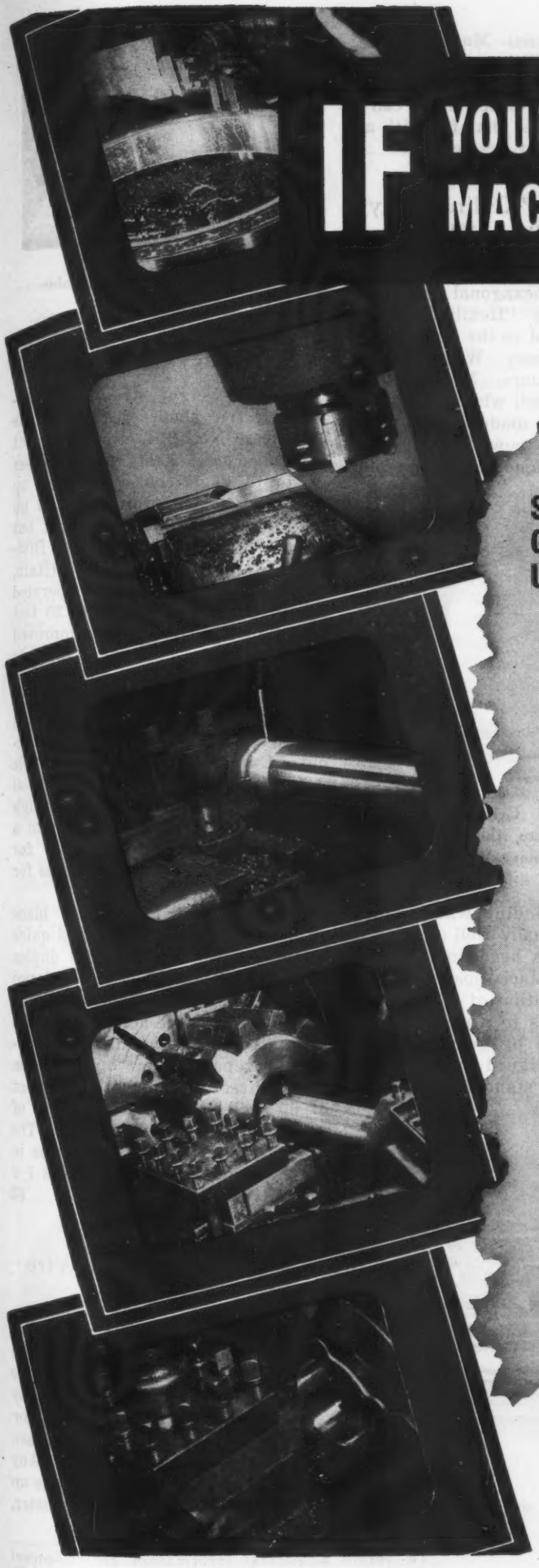


Hanchett Electromagnetic Chuck with Replaceable Faceplate



Pope Precision Compensating Live-center Tailstock Spindle

To obtain additional information on equipment described on this page, see lower part of page 182.



IF YOUR BUSINESS IS MACHINING *STEEL*

THE EXPERIENCE OF AMERICA'S SHELL-MAKERS IS SIGNIFICANT

SHELL-MAKERS USING KENNAMETAL GET UP TO 6 TIMES THE OUTPUT PER UNIT OF CEMENTED CARBIDE CONSUMED

Recent official reports regarding the national consumption of cemented carbides on tools used for machining 105 mm shells disclose the following significant facts:

Where carbides other than Kennametal are used, the average consumption per shell produced has been about 3 calculated grams.

Four large manufacturers who use Kennametal for 50% to 100% of their tools, consume on the average, only ¾ of a gram of carbide per shell.

Three plants using Kennametal exclusively, average less than ½ gram per shell.

In the current huge shell-producing program Kennametal is being used successfully on all the large sizes for roughing, finishing, facing, cutting off, grooving, and chamfering, as well as for de-burring of band grooves with a distinctive lathe file.

The properties of Kennametal that produce such notable results for shell makers are equally valuable to any company in the business of machining steel. Even the toughest alloys, and those having a hardness up to 550 Brinell, can be readily machined at economy-promoting speeds, and with unusually long tool life.

The effective constituent of steel-cutting Kennametal is tungsten-titanium-carbide ($WTiC_2$), which distinguishes it from all other cemented carbides, and is a major reason for its outstanding success.

Kennametal field engineers are fully experienced in the application of cemented carbide tools. They will be glad to help you on any steel machining problem.

KENNAMETAL

SUPERIOR CEMENTED CARBIDES

KENNAMETAL Inc., LATROBE, PA.

justment is required during the machining operation. Sealed lubrication assures uniform trouble-free operation for the life of the bearings. The particular live-center tailstock shown in the illustration is used on a production engine lathe. It is 53 inches long and 6 1/2 inches in diameter. Its center is readily removable without disturbing the bearings. The spindle is capable of supporting work-pieces weighing 10 tons or more. Centers of this type with the automatic compensating feature are available for lathes of other sizes.....66

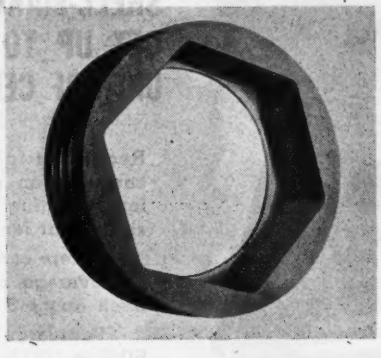
Grinding Attachments for Sharpening Bent-Shank Taps

A new grinding attachment for sharpening bent- and hook-shank taps is being placed on the market by the Edward Blake Co., 634 Commonwealth Ave., Newton Centre 59, Mass. This attachment can be easily mounted on any Model No. 2 Blake tap grinder now in use, and it can be quickly removed when the sharpening operations have been completed. A center is used to support the front end of the tap and a short-grip collet holds the shank immediately back of the threads. Tests have proved that this is the most accurate method of holding hook- or bent-shank taps during the sharpening operation, because the shanks of many taps of this kind do not line up accurately with the threads.

The attachment will permit grinding the chamfer on any bent-shank tapper tap up to 1/2 inch—13 size used on the 1/8-, 3/16-, 1/4-, 3/8-, or 1/2-inch automatic tappers, and any hook-shank tap up to the 9/16 inch—18 size used on 1/4-, 3/8-, or 1/2-inch precision tappers made by the National Machinery Co., Tiffin, Ohio. Either right- or left-hand taps with two, three, four, five, six, eight, or ten flutes can be sharpened on the chamfer with any amount of relief desired.....67

"Hexilinder" Cylinder Type Grinding Wheel

A new cylinder type grinding wheel with a hexagonal arbor hole, known as the "Hexilinder," has been announced to the trade by the American Emery Wheel Works, Richmond Square, Providence 1, R. I. The wheel, which is 18 by 5 by 2 inches, is made to take heavy cuts with low power consumption due to the unique shearing action.



"Hexilinder" Grinding Wheel Announced to the Trade by American Emery Wheel Works

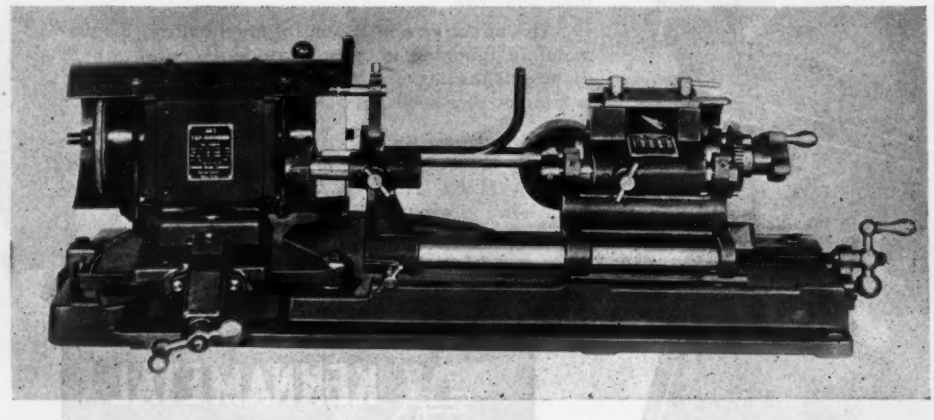
The new grinding wheel is said to function equally well on steel or cast iron. The hexagonal opening provides clearance space for the proper distribution of coolant, and thereby reduces to a minimum the heat generated by grinding. The wheel is so designed that it can be mounted on a standard Blanchard surface grinder. 68

Stanley Light-weight Portable Electric Shear

Stanley Unishear

A light-weight streamline portable electric shear, designated the Unishear No. 214, that will cut hot-rolled steel sheets in thicknesses up to 14 gage, cold-rolled steel up to 16 gage, and stainless steel up to 18 gage has been brought out by the Stanley Electric Tool Division, Stanley Works, New Britain, Conn. This shear can be operated at a cutting speed of 15 to 20 feet per minute. The simple, improved blade motion feeds the shear into the work, so that little effort is required by the operator in cutting straight lines, curves, angles, and notches with a high degree of accuracy. For inside cuts, a hole 2 1/2 inches is cut in the material and the yoke simply slipped through the hole. The shear will cut to a minimum radius of 1/2 inch for left-hand cuts, and 1 1/4 inches for right-hand cuts.

An improved method of blade adjustment permits easy and quick setting of the blades. The duplex handle enables the tool to be gripped in the most convenient operating position. A slide-actuated switch is located in the handle. The universal type motor operates on either direct or alternating current of 60 cycles or less at voltages of 115, 220, 230, or 250. The shear is 10 3/4 inches in length, and weighs 8 1/2 pounds. 69



Bent- and Hook-shank Tap Grinding Attachment Brought out by the Edward Blake Co.

Cable and Wire Stripper

A wire stripper for stripping insulation of all kinds from wire or cable has been brought out by the Ideal Commutator Dresser Co., 1011 Park Ave., Sycamore, Ill. Any length of wire or cable up to 5/8 inch diameter,

To obtain additional information on equipment described on this page, see lower part of page 182.

A copy
produc
cal on
be sen
Write

"Saw the heavens filled with commerce"

The world has grown up, aerodynamically, over night. Tomorrow's airliners and cargo ships—overseas leviathans and family flyabouts are here. Hovering helicopters and jet propelled planes are out of their swaddling clothes and on the production line. America is ready to take to the air.

Because war can't wait—airplanes have made technological advancement that would have meant years—perhaps decades of development under peacetime progress. In the matter of aircraft engines alone, not only has horsepower been tremendously increased, but entirely new principles in propulsion have been developed.

Today Foote Bros. "A-Q" (aircraft quality) gears are serving in the engines that power fighters, bombers and transports. Producers of the revolutionary helicopter and jet propulsion engines also rely on "A-Q" gears to help solve difficult problems in power transmission.

These gears represent a new advance in design and production methods. They assure greater mechanical efficiency, lighter weight, quieter operation, greater compactness. Applied to the machinery and equipment you are manufacturing or planning to manufacture, they will assure many competitive advantages—help you solve many engineering problems. Foote Bros. engineers will be glad to consult with you on the application of these new developments in power transmission to your product.

FOOTE BROS. GEAR AND MACHINE CORPORATION, Dept. P, 5225 S. Western Blvd., Chicago 9, Ill.

A copy of this informative product engineering manual on "A-Q" gears will be sent to you on request. Write for copy.

FOOTE BROS.

Better Power Transmission Through Better Gears

with single or parallel conductors, can be stripped. Plain blades are provided for stripping parallel wire, heater cord, etc., and grooved blades for rubber-covered and weather-proof cable. ——— 70

Smit Diamond Form-Grinding and Cutter-Sharpening Wheels

J. K. Smit & Sons, Inc., 157 Chambers St., New York 7, N. Y., have developed two new diamond wheels of unique design, one for special form-grinding work and the other for sharpening all types of multi-bladed cutters. These wheels are designed to provide maximum clearance and a minimum contact area between wheel and work. With the diamond sections mounted on the peripheries of the wheel cores, as illustrated, only the inside of the cores requires dressing as the diamond sections wear away. The cutting away of the core can be easily accomplished with a dressing stick. The shallow dish style form-grinding wheel, Type 660B, is especially designed for accurate grinding and to hold its form when used for the sharpest corner grinding operations. Rigidity provided by the Bakelite body facilitates the performance of delicate operations even at high speeds.

The flaring cup-wheel, Type D11B, is designed for economical general tool and cutter grinding. The maximum cutting efficiency of this wheel is due partly to the rigidity of the solid body construction. Various resinoid bonds are supplied to meet requirements of different types of work, BD bond being adapted for grinding the flutes of fine carbide-tipped reamers; BC bond for grinding intermediate-size carbide-tipped cutters; and BV bond for grinding larger cutters and for operations requiring heavy stock removal. These wheels are manufactured in 3-, 3 3/4- and 5-inch diameters.—71

Diamond Form-grinding and Cutter-sharpening Wheels

"Take-About" Portable Motor-driven Hand Surfacer

Porter-Cable "Take-About" Motor-Driven Hand Surfacer

A portable motor-driven surfacer known as the "Take-About," which is equipped with an endless abrasive belt 3 inches wide and 24 inches long operated at a speed of 1600 surface feet per minute, has been added to the line of portable electric tools made by the Porter-Cable Machine Co., 1801-6 N. Salina St., Syracuse 8, N. Y. This light-weight, easily handled surfacer can be taken to the job and used wherever an electric light socket is available to supply current for the 3/4-H.P. motor. The motor is of the universal type, 25-60 cycle, single phase, built for operation on either 115 or 220 volts.

The high belt speed of this surfacer provides faster grinding, and the perfect balance serves to lessen operator fatigue. The aluminum die-cast polished frame and plastic handle are of streamline design. A quick-acting trigger switch is incorporated in the handle. The drive is by means of a silent chain, and the driving and idler pulleys have needle bearings. The driving pulley is rubber-covered.

Large numbers of these surfacers are employed in metal- and woodworking plants, pattern shops, maintenance departments, assembly lines, furniture manufacturing plants, carpenter shops, schools, and boat-building industries. The surfacer shown is 5 1/8 by 16 by 7 3/4 inches, and weighs 14 pounds.—72

"DuBo" Improved Plug Gages

The Standard Gage Co., Inc., Poughkeepsie, N. Y., has brought out a new plug gage of the fixed-limit type, designated "DuBo." This improved type gage is designed to impart more information regarding the internal conditions of a bore than is possible to obtain with the conventional type of plug gage.

The smaller sizes of "DuBo" gages, for gaging holes from 0.240 inch to 1.510 inches in diameter,

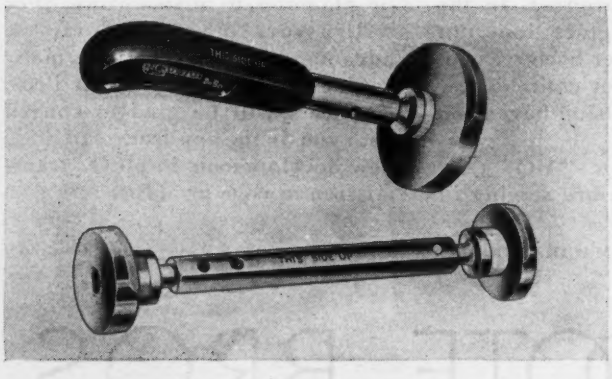


Fig. 1. "DuBo" Single- and Double-end Plug Gages

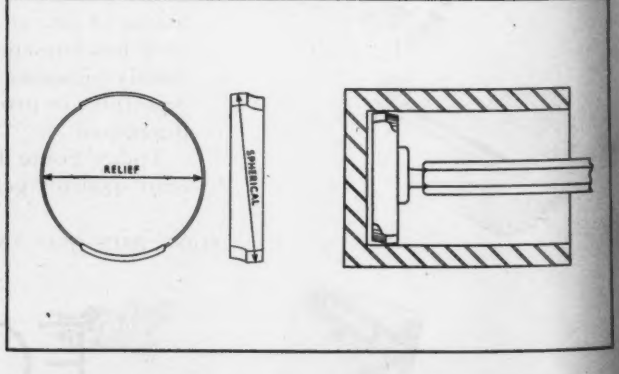
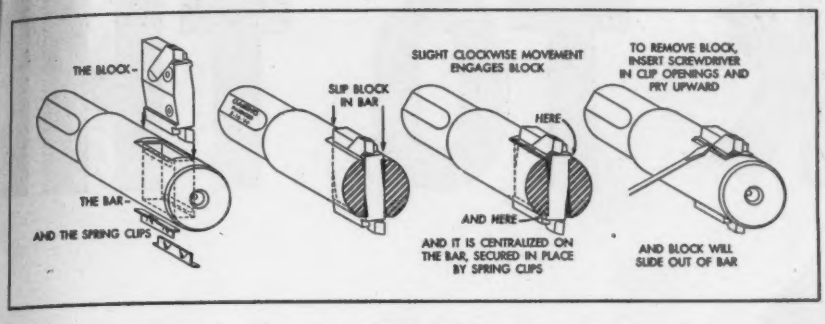


Fig. 2. Design Features of "DuBo" Gages

To obtain additional information on equipment described on this page, see lower part of page 182.



Gairing Boring Tool with a Quick-detachable, Positive-locking Cutter-block

have the "Go" and "No Go" gaging members attached to the opposite ends of a light-weight metal handle, as shown in the lower view of Fig. 1. The larger sizes, for holes from 1.510 to 6.010 inches in diameter, are made in the single-end type, and are mounted on palm fitting plastic handles, as illustrated in the upper view.

Both types utilize a new color identification system. The "Go" members of both the double- and single-end gages are marked with a broad band of vivid green enamel under a durable transparent plastic ring. "No Go" members are similarly identified by brilliant red bands. The handles of the double-end gages also carry corresponding dots of color. Thus the correct gage head can be immediately recognized.

The "DuBo" gage-head (Fig. 2) is a relatively thin disk having a spherical section that makes contact with the bore walls only at the correct point for accurate bore gaging. Two diametrically opposite chamfered sections on each gage make it possible to tilt the handle slightly to permit inserting the gage in the bore without using force or marring a highly polished surface. These gages can be used to check deep bores, as the handle does not touch the bore walls. The design of the "DuBo" gaging members also permits accurate gaging almost to the bottom of a blind hole, as indicated in the view to the right in Fig. 2. 73

Stamp for Round Bars

A holder for marking part numbers, dates, serial numbers, etc., with steel stamps on the periphery of solid round stock is being made by New Method Steel Stamps, Inc., 147 Jos. Campau, Detroit 7, Mich. This convex marker is so constructed that it permits bars to be clearly stamped around their peripheries.

The interchangeable steel type is tapered in such a manner that when assembled in the type retaining mortise with wedges, a predetermined radius is automatically formed by the sharp marking surfaces of the stamps. In the case of the four-character convex marker shown in the illustration, the stamp faces are located on a 2-inch radius for marking 4-inch bars. The ends of the individual type characters rest flat against a hardened-steel anvil, thus insuring impressions of equal depth and quality for all characters when the stamp is struck a single blow with a hammer. 74

Gairing Block Type Boring Tool

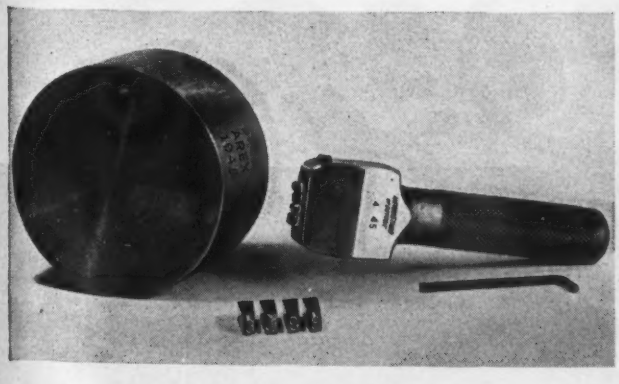
A boring tool with a quick-detachable, self-centering, and positive-locking cutter-block has been developed recently by the Gairing Tool Co., 21221 Hoover Road, Detroit 32, Mich. Provision for quick insertion of the block in the boring-bar and its easy removal without the aid of locating holes, screws, keys, wedges, or taper pins is an outstanding feature of this tool.

The cutter-block containing fully adjustable blades or cutters is of simple design, as shown in the illustration. It is designed to engage both sides of the precision-ground flats on the bar, and thus quickly and accurately center itself. When located, the cutting pressure thrust is evenly distributed against the back and bottom of the slot in the boring-bar. The blocks are fitted with high-speed steel, cast-alloy, or tungsten-carbide-tipped blades.

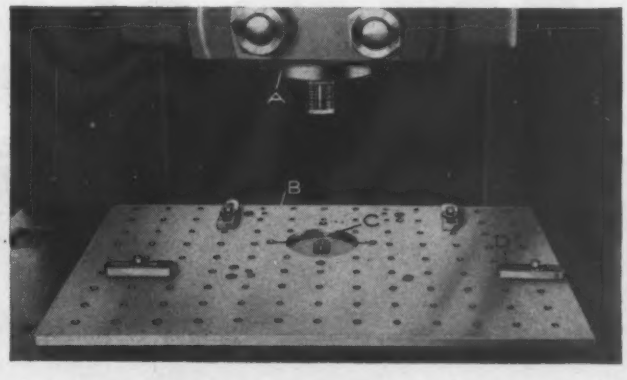
The tool-block is simply slipped through the slot in the bar until the projecting lugs engage the ground flats. The spring clips which hold the block securely in place are then inserted. These clips effectively seal the unit against the entrance of dirt or chips. 75

Whistler Single-Hole Perforator

S. B. Whistler & Sons, Inc., 752-756 Military Road, Buffalo, N. Y., have recently added to their line of adjustable punches and dies a new punching unit designed to reduce perforating costs where hole diameters range from 1/32 inch to 1 1/2 inches. The complete single-hole perforating equipment consists of an alloy-steel hardened punch-



Convex Marker for Round Bars, Made by New Method Steel Stamps, Inc.



Hole-perforating Equipment Brought out by S. B. Whistler & Sons, Inc.

To obtain additional information on equipment described on this page, see lower part of page 182.

LOOK TO THE

TYPICAL USES OF CARBOLOY CEMENTED CARBIDES

Sheet Metal Dies • Collets • Cams • Moulds • Textile Guides • Tools • Cutters • Bushings • Wire Dies • Mandrels • Punches • Masonry Drills • Fish Rod Guides • Brinell Balls • Gages • Knurling Pins • Rotary Files • Scrapers • Dental Chisels • Wheel Dressers • Bearings • Lathe Files • Steady Rests • Centers • Valve Stems and Seats • Rollers • Scribers • Burnishers • Machine Ways • Cylinders • Glass Laps • Wear Plates

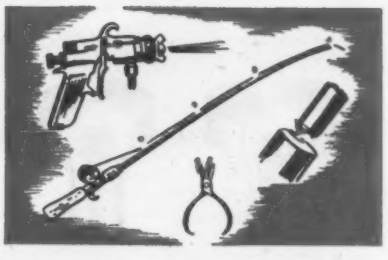
CARBIDES

For Better Ways to Make Better Products at Less Cost

IN MANY FIELDS OF USE

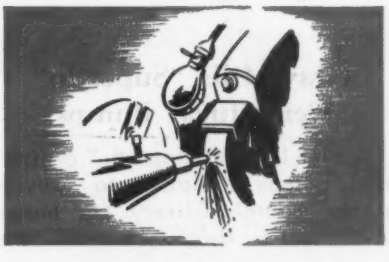
Cut all metals and non-metalics *FASTER* . . . save machines, manpower, time!

Draw and form sheet metal parts with greater output, finer finish, closer limits.

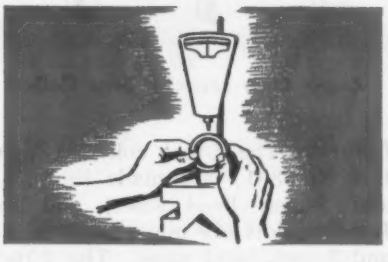


Improve the products you SELL, by "wearproofing" vital parts with carbides for extra-long life.

Keep machine maintenance costs *DOWN*, production *UP*, with carbide-tipped parts.



Dress grinding wheels at lower diamond cost per dressing, with diamond-impregnated dressers.



Step-up inspection efficiency with accurate, long-life gages of all types tipped with carbide.

CARBOLOY COMPANY, INC.

11147 E. 8 MILE AVENUE, DETROIT 32, MICHIGAN

Also sold by 28 Authorized Distributors throughout the nation plus 116 leading manufacturers of Carboloy-tipped Tools, Cutters and special parts.

CHICAGO • CLEVELAND • HOUSTON • LOS ANGELES • MILWAUKEE • NEWARK • PHILADELPHIA • PITTSBURGH • THOMASTON

CARBOLOY

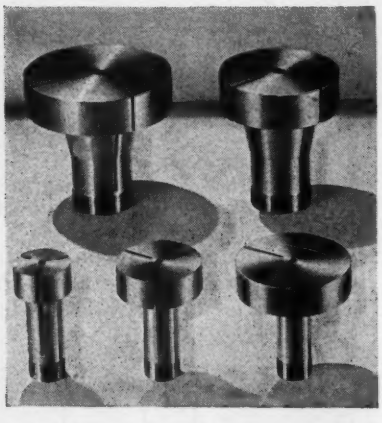
(TRADEMARK) CARBOLOY CEMENTED CARBIDES

"THE HARDEST METAL MADE BY MAN"

holder, shown at *A* in the accompanying illustration, in which four hardened and ground punch adapter rings can be interchanged to accommodate punches from 1/32 inch to 1 1/2 inches; a semi-tempered steel die-shoe; a gage-plate *B*, 16 by 24 inches in size; four hardened and ground die adapter rings that are interchangeable at *C* for the required range of die bushings; and four gages *D* for positioning sheets to be perforated. 76

Zagar Over-Capacity Step Collets

Zagar Tool, Inc., 23880 Lakeland Blvd., Cleveland 17, Ohio, has brought out a line of over-capacity step collets which are available for both 1- and 2-inch Zagar collet



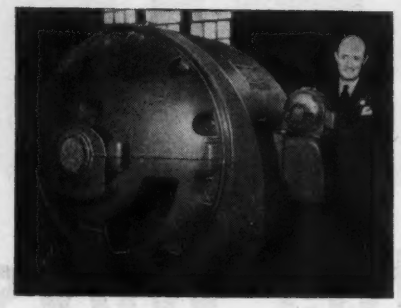
Zagar Over-capacity Step Collets

fixtures. The 2-inch collets (Zagar tool No. 301) are made in 3-, 4-, and 5-inch head sizes, and the 1-inch collets are made in 2-, 3-, 4-, and 5-inch head sizes. The 2-inch collets can be used wherever a Type 5-C collet is employed.

The heads are 1 inch thick, and are made of M-tempered tool steel, finish-ground, and left in a soft condition so that the customer can bore them to suit the individual job. Machining and heat-treating instructions are included with each collet. 77

General Electric Giant Size "Tri-Clad" Motor

The Motor Division of the General Electric Co., Schenectady 5, N. Y., has just announced the addition of a 2000-H.P. motor to its "Tri-Clad" line. This huge, squirrel-cage, induction type motor—the largest of this type ever built—is especially designed for use in large central power stations and for large industrial applications. It is classed in the 6360-frame series, which is five steps larger in diameter than the largest standardized frame, and operates on a 2300-volt, three-phase, 60-cycle circuit. The operating speed is 1800 R.P.M. at the 2000-H.P. rating.



"Tri-Clad" 2000-H.P. Motor Recently Added to G.E. Line

All the basic protective features of the "Tri-Clad" line, including protection against physical damage, electrical breakdown, and operating wear and tear, are incorporated in this motor. The end shields are of split cast-iron construction, designed to facilitate maintenance and provide exceptional resistance to rust, corrosion, accidental blows, and rough usage. 78

Gray-Mills "Superflo" Centrifugal Pumps

A new line of "Superflo" centrifugal pumps designed to provide higher volume delivery per horsepower and to simplify maintenance problems has been announced by the Gray-Mills Co., 1948 Ridge Ave., Evanston, Ill. Heavy-duty motors are integrally mounted with the pumps to obtain compactness and strength. The 1/25-, 1/8-, 1/4-, and 1/2-H.P. motors used in this line of pumps cover a volume capacity range of 9 to 75 gallons per minute. The thirteen basic models in this line are available with motors having various voltage characteristics.

Three of the Thirteen Basic Models of "Superflo" Pumps

The complete line includes types for horizontal-external mounting and for vertical-external mounting, as well as floating impeller types that are made to be submerged in the coolant system reservoir. The latter may be used for fluids having an abrasive content. The grease-sealed motor bearings and mechanical seals of the pumps require no lubrication. 79

Mercury-actuated Clutch

Mercury Automatic Clutches

The new 450 series Type C mercury-actuated clutches recently added to the line brought out by the Mercury Clutch Corporation, Canton 6, Ohio, are designed to meet the requirements for transmitting from 1 to 7 1/2 H.P., depending on speed and service factors. This clutch is only 4 1/2 inches in diameter, and is made in five widths ranging from 3 5/16 to 4 11/16 inches to cover the specified horsepower range. It is available in the regular clutch type with grooved pulley, as illustrated, or in a coupling type designed for direct drive.

Like the mercury-actuated clutches previously announced by this company, the new series has the inherent advantage of delayed action, which permits an electric motor to

To obtain additional information on equipment described on this page, see lower part of page 182.

OUT GOES SPOILAGE!

Hamstrung by work-spoiling driver skids while he used slotted screws, a certain radio cabinet manufacturer made a complete switch-over to Phillips Recessed Head Screws. Result: production shot up like a rocket!

DOWN GO COSTS!

With this upward swing in production, there was a consequent *downward* swing in costs. A downswing that was helped along plenty by the fact that Phillips Screws drive up to 50 percent faster!

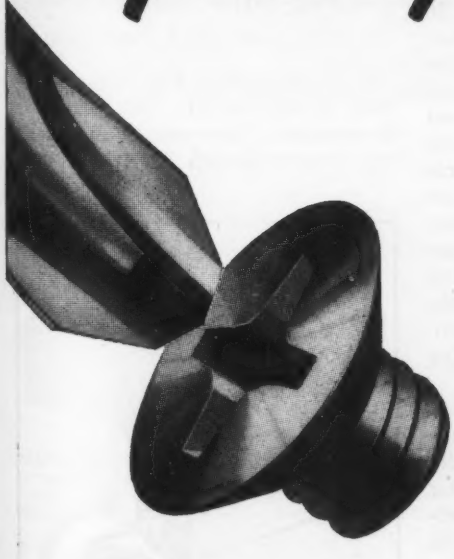
UP GOES STRENGTH!

On production . . . on costs . . . yes, also on design, . . . use of Phillips Screws makes a big difference. Engineered for heaviest driving pressures, they help designers plan exceptional strength and rigidity into products!

AWAY GOES SALES RESISTANCE!

Saleswise, too, use of Phillips Screws pays off. They not only add to a product's strength, smartness, and general good looks. They also banish burrs that snag clothes and sidetrack sales!

It's Phillips — the engineered recess!



In the Phillips Recess, mechanical principles are so correctly applied that every angle, plane, and dimension contributes fully to screw-driving efficiency.

. . . It's the exact pitch of the angles that eliminates driver skids.

. . . It's the engineered design of the 16 planes that makes it easy to apply full turning power – without reaming.

. . . It's the "just-right" depth of recess that enables Phillips Screw Heads to take heaviest driving pressures.

With such precise engineering, is it any wonder that Phillips Screws speed driving as much as 50% – cut costs correspondingly?

To give workers a chance to do their best, give them faster, easier-driving Phillips Recessed Head Screws. Plan Phillips Screws into your product now.

PHILLIPS Recessed Head SCREWS

WOOD SCREWS • MACHINE SCREWS • SELF-TAPPING SCREWS • STOVE BOLTS

Made in all sizes, types and head styles

25 SOURCES

American Screw Co., Providence, R. I.
Atlantic Screw Works, Hartford, Conn.
The Bristol Co., Waterbury, Conn.
Central Screw Co., Chicago, Ill.
Chandler Products Corp., Cleveland, Ohio
Continental Screw Co., New Bedford, Mass.
The Corbin Screw Corp., New Britain, Conn.
General Screw Mfg. Co., Chicago, Ill.
The H. M. Harper Co., Chicago, Ill.
International Screw Co., Detroit, Mich.
The Lamson & Sessions Co., Cleveland, Ohio
Manufacturers Screw Products, Chicago, Ill.
Milford Rivet and Machine Co., Milford, Conn.
The National Screw & Mfg. Co., Cleveland, Ohio
New England Screw Co., Keene, N. H.
Parker-Kalon Corp., New York, N. Y.
Pawtucket Screw Co., Pawtucket, R. I.
Pheoll Manufacturing Co., Chicago, Ill.
Reading Screw Co., Norristown, Pa.
Russell Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Scovill Manufacturing Co., Waterville, Conn.
Shakeproof Inc., Chicago, Ill.
The Southington Hardware Mfg. Co., Southington, Conn.
The Steel Company of Canada Ltd., Hamilton, Canada
Wolverine Bolt Co., Detroit, Mich.

attain its effective speed instantly and without load, after which it applies the power smoothly for starting and accelerating the speed under load at a rate that will not unduly slow down the motor. When used with an internal-combustion engine, it permits idling without carrying the load, which is automatically picked up as the engine is speeded up. Provision can be made for complete release of the clutch at any desired speed. The new series clutches provide overload protection. 80

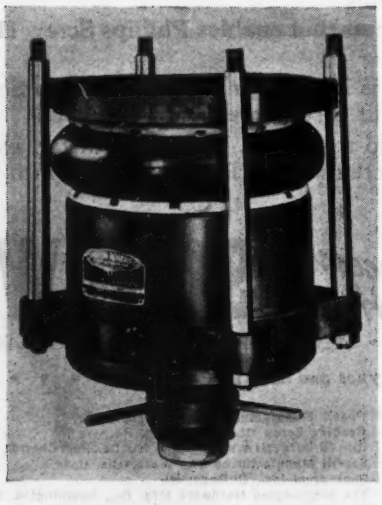
Dayton Rogers Bellows Type Die Cushion

The Dayton Rogers Mfg. Co., 2835 Twelfth Ave. S., Minneapolis 7, Minn., has recently developed a pneumatic die cushion that employs a molded synthetic-rubber bellows in place of the conventional type piston and cylinder. The synthetic-rubber bellows absorbs the die cushion travel of the hardened and ground pin pressure pad. The bellows type die cushion under test has been flexed in excess of three million cycles without any appreciable deterioration of the synthetic-rubber molding, and will stand working pressures up to 300 pounds per square inch.

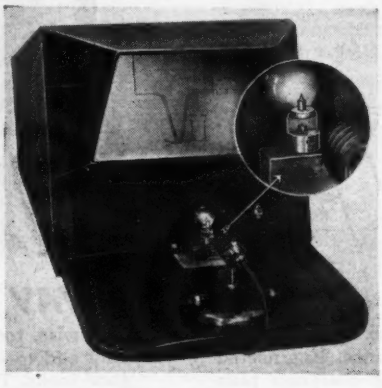
The synthetic-rubber molding is not affected by oil in the air line, grease, or other drawing compounds. Air leakage is said to be eliminated by the balloon tire type of bellows used. No regulating or reducing valve is necessary.

These air cushions are made in sizes of from 5 to 12 inches, having drawing capacities up to 5 inches, and can be used satisfactorily on all deep drawing work within their capacity, as well as for pressure-pad control on a large percentage of forming dies, including those handling ejector work.

The bellows die cushion can be readily fastened to the bolster plate of the average press by means of four suspension rods. It is also designed so that a supporting structure can be furnished, making it possible to fasten the suspension rods to the press bed, and allowing the bolster plate to be removed without disturbing the die cushion unit. 81



Bellows Type Die Cushion



Young's Multiple Gage Placed on the Market by Adroit Mfg. Co.

Young's Multiple Gage

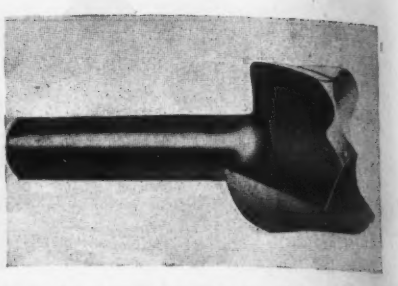
The Adroit Mfg. Co., Inc., 76 Gerry St., Brooklyn 6, N. Y., has just introduced to the trade the Young's multiple gage here illustrated which has been developed for the rapid, precise gaging of one or more dimensions of small parts or the gaging of complete contours of intricate parts in one operation. The optical system of this gage can be employed to obtain calibrated magnifications of 20X, 25X, and 30X on the inspection screen. Special lenses can be supplied for magnifications from 10 to 500.

The gage shown in the illustration is set up for gaging ten dimensions of a part at one time at the rate of 1000 pieces an hour, making possible the release of five inspectors previously required. 82

"Micro-King Mill-Drill"

Sheet metals that twist out of shape and plastics that are shattered under ordinary drilling operations can be readily drilled with a new tool designated "Micro-King Mill-Drill" recently brought out by Steel Tools, Inc., 2307 Prospect Ave., Cleveland 16, Ohio. No preliminary or lead holes need be drilled when using this tool, which is claimed to produce smooth, accurate holes in one operation and to drill closely spaced holes without tearing metal or shattering plastics.

High-speed chrome-plated drills of the new type are available in sets covering sizes from 1/16 inch to 2 inches. The same drills can be used for drilling plastics and sheet metals. Materials such as Lucite, Plexiglas, Bakelite, Lignolite, and other plastics, brass, copper, aluminum, and tin sheets, as well as magnesium bars and hard rubber, can be drilled smoothly and successfully with these drills. 83



"Micro-King Mill-Drill" Designed for Drilling Metal and Plastic Sheet Materials

Gray-Mills Small-Parts Cleaner and Solvent

The Gray-Mills Co., 1948 Ridge Ave., Evanston, Ill., has placed on the market a new small-parts cleaning system known as Model P-72,

Gray-Mills Small-parts Cleaner

To obtain additional information on equipment described on this page, see lower part of page 182.

Nothing Complicated About

REEVES SPEED CONTROL

For this engine lathe, in a West Coast Machine Shop, the rugged REEVES Variable Speed Transmission was selected for its absolute accuracy in providing the correct turning speeds at all times for each set-up. Note extended hand wheel control for varying speed.

Simple, Rugged, Accurate
—Easy to Install, Operate and Maintain

The operation of a REEVES Variable Speed Drive is as simple as A. B. C. The operating principle and construction are readily understandable at a glance.

There are no delicate electrical or mechanical "gadgets" to require expert adjustment or repair—no fragile parts to break or be affected by wear. Like Old Man River, a REEVES drive "just keeps rolling along," day after day, month after month, year after year with minimum maintenance attention. Records that REEVES Transmissions are still providing accurate, dependable speed adjustability after 40 and more years' constant service are not unusual.

Time-Tested Operating Principle

REEVES is now in its 57th year of continued pioneering in the field of variable speed control. There have been many improvements and refinements in the design and construction of REEVES units, but the operating principle is the same—time-tested and proved in more than 265,000 installations on all types of driven machines in all types of plants.

Solves Production Problems

REEVES Speed Control is the answer to accurate production control in a large number of manufacturing operations—feeding, cutting, drilling, stamping, conveying, mixing, heating, winding, etc. It provides instant *accurate* speed adjustability for every changing condition. Tell us what you want to accomplish. Our staff of seasoned Speed Control engineers is at your service to help you solve your problem. Write us.

The 3 Basic Units in the Reeves Line

VARIABLE SPEED TRANSMISSION for providing infinite, accurate speed flexibility over wide range. Send for Catalog T-443.

VARI-SPEED MOTOR PULLEY converts any standard constant speed motor to a variable speed drive. Send for Catalog V-440.

MOTODRIVE combines motor, speed varying mechanism and reduction gears in single compact unit. Send for Catalog M-441.

REEVES PULLEY COMPANY • COLUMBUS, INDIANA

REEVES *Accurate Variable* SPEED CONTROL

and a new line of cold-cleaning solvents called "Agitene." The P-72 cleaner is adapted for removing cutting oils and lubricants employed in metal-working operations. It is suited for a wide variety of simple cleaning operations, including small parts that require cleaning in limited quantities.

Outstanding features of the P-72 cleaner include a time-saving "Air-gitator" which provides air agitation of the cold solvent, swisher basket and platform, hinged cover, air hose, and T-connection. This unit is 15 1/2 by 15 1/2 by 11 1/2 inches, and has mounting brackets for attachment to the side of the larger Model P-70 Gray - Mills cleaner or to a wall or work-bench.

The cold-cleaning solvents come in three types—regular Agitene for general-purpose cleaning, including the removal of cutting oils and other lubricants; Super-Agitene, which is a fast acting solvent with a powerful penetrating action that quickly removes grease, tar, and sludge; and Speed-Agitene for use in the removal of hard accumulations, residual gums, and grease deposits. The latter solvent has been developed to remove grease and sludge without harming the metal being cleaned. 84

General Electric Armor-Clad Insulated Electrode-Holder

A new armor-clad, screw-type, fully insulated electrode-holder has been announced to the trade by the Electric Welding Division of the General Electric Co., Schenectady 5, N. Y. This holder is recommended for use wherever durability, safety, and minimum operator fatigue are major factors.

A feature of the new holder is the sheath of aluminum armor which completely encloses the head. This armor protects the insulation, resists weld spatter, and eliminates the possibility of accidental contact with the welding circuit. Thus the holder remains clean while in use, and is claimed to last considerably longer than insulated holders that do not have the armor-clad feature.

This holder is easy to use, weighs only 15 ounces, is unusually cool in operation, and will accommodate electrodes up to and including 1/4 inch in diameter. A slight twist of the hand serves to tighten or release the electrode. While in use, the holder grips the electrode firmly at the proper angle and maintains a good contact with it. This keeps the holder cool, tends to prevent overheating of the electrode and maintains a uniform melting rate. The threads of the push-up rod do not carry any current. 85

G-E Armor-clad Fully Insulated Welding-electrode Holder

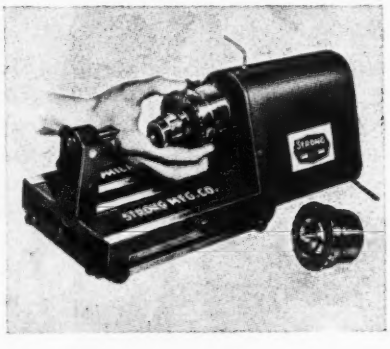


Fig. 1. Strong Grinder Attachment with Collet-holding Faceplate that is Interchangeable with Standard Index Faceplate

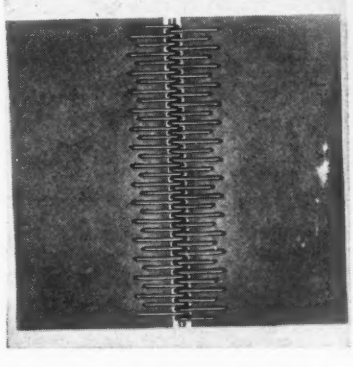
Strong "Multi-Purpose" Grinding Attachment

The "Multi-Purpose" attachment developed by the Strong Mfg. Co., 5312 Westminster Ave., Philadelphia 31, Pa., to adapt surface grinders for cylindrical grinding operations on small work, which was described and illustrated in November, 1944, MACHINERY, page 206, has recently undergone improvements to increase its versatility. The improved attachment, as shown in Fig. 1, can now be supplied with a standard index faceplate and a collet-holding faceplate, which can be readily interchanged in the attachment. The collet-holding faceplate and the collets, covering a range of sizes of 0.093 to 0.562 inch, can be furnished complete in a wood cabinet as shown in Fig. 2.

Fig. 2. Strong Collet-holding Faceplate and Fifteen Precision Collets for Use in Grinder Attachment Shown in Fig. 1

Cylindrical work held between centers on the attachment or by the collet is rotated by the attachment motor while the table of the surface grinder on which it is mounted is adjusted and fed back and forth. Provision is made for setting the attachment accurately in a tilted position for precision - grinding tapered work.

For grinding other than cylindrical surfaces, such as the faces of rectangular, square, triangular, hexagonal, octagonal, and similar work, the motor is stopped and the index faceplate locked for grinding each flat surface. 86



Wire Belt Hooks Made by the Bristol Co.

Bristol Wire Belt Hooks

The Bristol Co., Mill Supply Division, Waterbury 91, Conn., has announced the addition of a line of hinged type wire belt hooks to its line of belt lacing. The new hooks are designed for joining all types of flat belting, including leather, fabric, rubber, and balata belts. They are made in various sizes for use with belts up to 3/8 inch thick.

To obtain additional information on equipment described on this page, see lower part of page 182.

A new method of mounting the hooks in the spacer card makes it possible to leave the card in the lacing machine during the lacing operation. The hooks are thus held in accurate alignment until the hook points have piereed the belt, after which the card is removed. This procedure insures uniform spacing of the hooks and results in an even distribution of pull over the entire width of the belt.

These hooks are designed to enter the belt in two rows, with each opposite point piercing the belt in alternate rows. The purpose of this arrangement is to eliminate interference between opposite hook points as they are pressed into place and to distribute the grip on the end of the belt over a greater area. 87

Knu-Vise Toggle-Action Clamp

A new toggle-action clamp, designed for use where unusually high pressure is required for clamping at an angle to the base mounting, has been placed on the market by Knu-Vise, Inc., Detroit 16, Mich. This clamp, known as Model KV-221, is slightly larger and sturdier than the previous Model KV-220 clamp. The new clamp can be used to advantage on the inner surfaces of jigs where operating space is limited. It can also be used as a locating device in progressive drilling fixtures.

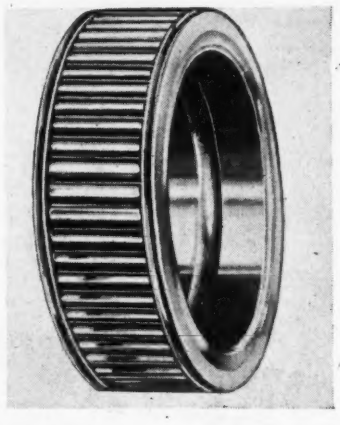
The clamp weighs 23 ounces, and measures 7 1/8 inches high by 6 1/8 inches long. Its recommended maximum loading at the end of the standard toggle bar is 240 pounds.

A Model KV-210 toggle-action clamp similar in appearance and clamping capacity to the one illustrated, except that it is designed for clamping at right angles to the base, has also been added to the Knu-Vise line. The toggle bar can be reduced in length for mounting close to work so as to obtain increased holding power. The bar can be used for direct clamping or it can be equipped with a spindle held by a standard bolt retainer which is welded to the end of the bar. 88

Knu-Vise Toggle-action Clamp for Clamping at an Angle

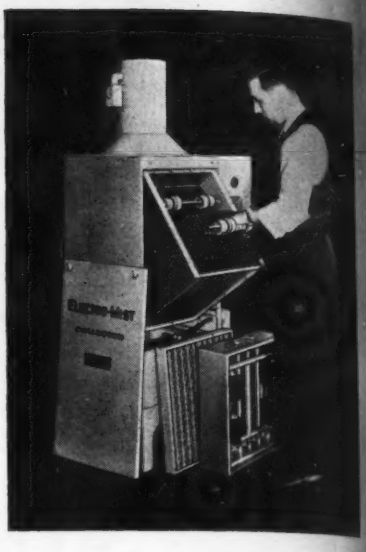
McGill Inner Race and Roller Assembly

A "Solidend Multirol" bearing inner race and roller assembly, for use where the outer raceway can be machined in a part that has been heat-treated to obtain the required surface hardness, has been brought out by the McGill Mfg. Co., Inc., Valparaiso, Ind. This bearing assembly is designed as a self-contained unit, and is made in both single- and double-row types. It is similar to the regular line of "Solidend Multirol" bearings except that it has no outer race.



McGill Single-row Inner Race and Roller Assembly

A typical application of this inner-race assembly is found in constant-mesh transmission gears, where the ground bores of the hardened gears act as outer raceways. The small radial space required by this bearing and its great load-carrying capacity, especially under static conditions, can often be used to advantage. The races and rollers are made of high-carbon chromium steel to close manufacturing tolerances. 89



Electro-Mist Electronic Air Filter

Electro-Mist Electronic Air Filter Designed to Salvage Oil

The American Air Filter Co., Inc., 215 Central Ave., Louisville 8, Ky., has recently added to its line of electronic air filtration equipment the Electro-Mist self-contained, demountable electronic unit, designed to collect oil mist from high-speed cutting tool operations or from fumes produced by welding. An axial flow fan, mounted on top of the unit, draws air from the operating tool through a hood and piping or flexible tubing, and discharges it into the base of the unit.

In its application to cutting operations, the mist-laden air is first passed through a permanent filter to remove any metallic dust or large drops of oil. It then enters the ionizer in which the mist and smoke particles receive an electrical charge before passing into the collector unit where they are precipitated on the plates. The collected oil mist accumulates and drips off the lower edge of the plates through the filter and into a reservoir below. As much as two or three gallons of oil can be salvaged daily, and can be piped back into the machine tool or drained off as preferred.

The Electro-Mist is 28 3/4 by 20 3/4 by 70 inches in size. The power pack is operated on a 115-volt, 60-cycle, single-phase current. In the case of multiple installations, one large power pack can be used to serve ten Electro-Mist collectors. 90

MACHINERY
Vol. 51 No. 11 July, 1945

To Complete Victory!

Victory in Europe brought a full realization of the tremendous contribution made by the aircraft industry in the annihilation of our enemies' fighting men and in the destruction of their war production industries. Because the same devastating treatment must still be accorded Japan, the aircraft industry carries on – not on as great a scale as during the last year, but on a scale tremendous in comparison with the early war years. There has been no curtailment in the application of engineering brains in aircraft plants to the development of new manufacturing methods for turning out Superfortresses, jet planes, and other types of aircraft especially adapted to warfare in the Pacific area. Noteworthy new processes and unique applications of older methods feature this eighth annual Aircraft Production number of MACHINERY. They offer wide possibilities to other metal-working industries for the solution of their present and post-war manufacturing problems.

Photo Courtesy Boeing Aircraft Co.

Cold Impact

J&L HOT ROLLED BARS

Made from J&L Controlled Quality Steel for machining, forging, stamping, and many other uses. Available in round, hexagon, square, and flat sections, also special shapes and die-rolled sections. All J&L Hot Rolled Bars conform to exacting standards for accuracy and finish.

JONES & LAUGHLIN STEEL CORPORATION

PITTSBURGH 30, PENNSYLVANIA

Jobs for Disabled Veterans

The mounting war casualties will mean a vast increase of war disabled veterans. It will also mean a need for a large number and a wide assortment of suitable jobs for these men when they return and are discharged from the hospitals. The American Veterans Association, Inc., has published a comprehensive folder entitled "Jobs for the War Disabled," which concisely, but quite completely, answers the question that may be raised by industrial managers with regard to the possibility of employing disabled veterans.

Small concerns can do their share as well as the larger ones, and the problem, when systematically approached, is not as complex as it may seem on first thought. As stated in the folder, the solution of the problem is not complex, but needs a little advance planning, the exercise of common sense, and the appointment of an interested intelligent individual who will undertake to analyze the available jobs in a manufacturing plant and decide which of them fit the capabilities of the disabled veterans that are applying for a job. Copies of this folder can be obtained by applying to the American Veterans Association, Inc., 271 Madison Ave., New York 16, N. Y.

* * *

Rosan Inserts Used on Curtiss-Wright Propeller Motor Housings

The metal of the reduction gear housing of a Curtiss propeller motor was too soft to permit the use of cap-screws inserted directly into the metal as a permanent fastening means. For this reason, Rosan locked-in inserts, as made by Bardwell & McAlister, Inc., Hollywood, Calif., were used to furnish fastening points which would give added fastening strength to the soft metal.

These inserts consist of two pieces—an insert with a serrated collar, and a steel locking ring which is serrated both on the inside and outside. The insert is screwed into a counterbored tapped hole flush with the surface of the parent material, and the locking ring is then pressed or driven into the counterbore. The inner teeth of the ring engage the teeth on the collar of the insert, while the outer teeth broach the wall of the counterbore and lock the insert in place, so that the unit becomes an integral part of the parent material. It will not turn or loosen under vibration or torque, and it can easily be removed for replacement by a simple drilling operation.

* * *

The Art of Generating with a Reciprocating Tool

A book of forty-eight pages, 8½ by 11 inches, that is virtually a text-book on the "Art of Generating with a Reciprocating Tool," has been published under that title by the Fellows Gear Shaper Co., Springfield, Vt. The book, which is exceptionally well illustrated and concisely written, introduces the subject by showing how various types of surfaces are generated by single-point tools and disk cutters; then follow chapters on "Principle of 'Conjugate' Generating;" "Applications of 'Offset' and 'Conjugate' Generating;" "Application of 'Off-Center Conjugate' Generating;" "Applications of 'Interrupted-Conjugate' Generating;" "Principle of 'Describing' Generating;" and "Reciprocating Tool Applications and Attachments." The examples presented have been selected to illustrate basic principles; and while all possible applications are not covered, the selection of the applications has been so carefully made that the wide range of work which can be produced by the generating methods described is clearly demonstrated.

* * *

Protection Against Skin Infections

A new type of skin protector compound known as "Sealskin," for the prevention of occupational dermatitis, has been developed by Cadet Laboratories, Department MS2, Worcester 5, Mass. This compound, if applied to the mechanic's hands once daily, forms a durable, invisible, waterproof coating over the skin which acts as a preventive against infection, and from which dirt and grime can be washed with soap and water.

New Liquid Insulation for Ignition Systems

A liquid insulation, known by the trade name "Pib," has been widely used by the armed forces for waterproofing ignition systems and batteries of jeeps, tanks, trucks, and various types of amphibious vehicles. This insulation has now been introduced on the civilian market by U. S. Industrial Chemicals, Inc., 60 E. 42nd St., New York City. While this material was primarily designed for waterproofing ignition systems and preventing corrosion of batteries in motor vehicles, it is equally applicable for similar insulation purposes in the electrical and mechanical industries, in aviation, marine engineering, and in the home.

As an example of the remarkable properties of this insulation material, U. S. Industrial Chemicals recently staged a demonstration exhibiting an open electric motor treated by "Pib," which has continuously run submerged in a water tank for two years with an exposed light bulb also operating under water. The exhibit also showed how a battery is short-circuited and its life shortened by corrosion, and how the new product prevents this type of damage. The material is applied with either a brush or a spray to wire coils, distributors, spark plugs, and the top of batteries.

* * *

Westinghouse Engineering Scholarships

Ten scholarships valued at $1850 each, sponsored by the Westinghouse Electric Corporation, Pittsburgh, Pa., have been awarded to high school students of high scholastic standing. As many as 887 high school senior boys enrolled in this year's contest, the largest group to register for the competitive examinations since their inauguration in 1938.

The tests were administered by the College Entrance Examination Board officials at various points throughout the United States. They included a three-hour examination in mathematics, one hour in the ability to visualize in three dimensions, one hour in either physics or chemistry, and one hour in subjects on social studies.

BRIGGS FILTRATION HERE

SHOWS UP HERE

OPERATING REPORT*
OF BRIGGS FILTER ON
GISHOLT TURRET LATHE

Production of Machine doubled in one year

Coolant Life is 3 Times Longer

Tool Life Increased 300%

Period Between Tool Grinds Lengthened 6 Times (4 hrs. to 24 hrs.*)

Lube Oil Filter on Headstock Eliminates Sluggish Operation by Preventing Formation of Gum on Gears

Clutches do Not Bind - useful life more than doubled

*Report on actual installation

Briggs Coolant Filters and Oil Clarifiers quickly pay for themselves in increased production and reduced maintenance . . . as this actual report clearly shows. What it doesn't show however, is the better work produced . . . closer tolerances, better finish. It doesn't show that the danger of dermatitis was minimized.

Effective filtration of coolants or lube oil may be the solution to your production and maintenance problems. Briggs Filters are available for unit machines, central systems or special applications . . . for all types of coolants and oils.

Get in touch with the Briggs distributor nearest you (listed in the "Filter" section of your Classified Telephone Directory) or write direct for complete descriptive literature.

Briggs

PIONEERS IN MODERN OIL FILTRATION

BRIGGS CLARIFIER COMPANY

General Offices, Washington 7, D. C. • Distributors in Principal Cities

News of the Industry

California

HERBERT KING, of King & Anderson, has been appointed field representative for the General Alloys Co. in the state of California, with offices at 625 Tilden Sales Bldg., 420 Market St., San Francisco, Calif. Mr. King was for nine years vice-president in charge of sales for the National Battery Co. and its subsidiaries.

STOW MFG. CO., Binghamton, N. Y., manufacturer of flexible shafts, announces that arrangements have just been completed for opening a service branch at 1401 Third St., San Francisco, Calif. LEON L. ALLEN will have charge of the new branch.

C. G. COX has been appointed to the executive staff of the Joshua Hendy Iron works, Sunnyvale, Calif. Mr. Cox was formerly vice-president and general manager of the Enterprise Engine & Foundry Co. of San Francisco.

District of Columbia

CHARLES W. MILLER, JR., who has been actively associated with the aviation industry for more than twenty years, has joined the engineering staff of the Briggs Clarifier Co., Washington, D. C., manufacturer of oil filtration equipment. Before joining the Briggs organization, Mr. Miller was president of Aircraft Enterprises Inc., Bridgeport, Conn.

E. DIGGES LA TOUCHE has been placed in charge of the field service engineering staff of the Aviation Division of Briggs Clarifier Co., Washington, D. C., manufacturer of oil filtration equipment. Mr. Digges La Touche was previously executive assistant to the Director General of the British Air Commission.

Illinois and Indiana

NORBERT K. KOEBEL has been appointed manager of sales for the Lindberg Engineering Co., 2450 W. Hubbard St., Chicago 12, Ill. Since October, 1940, Mr. Koebel has been director of research, in which capacity he will continue to serve. ROBERT W. DOUGHERTY has been transferred from Chicago to Detroit, where he is now associated with FRANK J. CONDIT, of the Lindberg Detroit sales office at 7338 Woodward Ave., Detroit 2, Mich.

ALLAN M. CAMERON has been appointed general manager of equipment development and manufacturing of the Continental Can Co., Inc., 100 E. 42nd St., New York 17, N. Y. He will have jurisdiction over all the company's machine shops and related development work, and will maintain his headquarters at the McDonald machine shop in Chicago, Ill.

J. L. MULLIN has recently been promoted from the position of general superintendent of foundries of the American Manganese Steel Division, American Brake Shoe Co., Chicago Heights, Ill., to vice-president in charge of operations.

STERLING TOOL PRODUCTS CO., Chicago, Ill., has acquired an additional 19,000 square feet of floor space at the site of its present factory, 363 E. Ohio St., for post-war expansion purposes.

LEE A. DAINES, since 1927 district manager in Chicago for the Heppenstall Co., Pittsburgh, Pa., has been elected vice-president and general manager of sales.

STERLING ALLOYS INC., Woburn (Boston) Mass., has appointed STANLEY G. DISQUE, 620 Board of Trade Building, Indianapolis, Ind., engineering service representative for the company in the state of Indiana.

Michigan

E. H. WELKER AND ASSOCIATES, Detroit, Mich., have purchased the ULTRA-LAP MACHINE CO., 247 McDougall Ave., Detroit 7, Mich. The officers of the new company are E. H. WELKER, president; NORMAN WALKER, vice-president and general manager; ERNEST P. LAJOIE, secretary and treasurer; and HOWARD HARTNESS, assistant secretary and treasurer.

E. H. Welker, Newly Elected President of the Ultra-Lap Machine Co.

BOYD V. GIESEY has been appointed head of the recently expanded Flash Welder Division of the Progressive Welder Co., 3050 E. Outer Drive, Detroit 12, Mich. Mr. Giesey has been associated for the last nine years with the Taylor-Winfield Corporation, recently as a design engineer specializing in the design and development of flash welders.

GEORGE SPATTA, formerly executive vice-president of the Clark Equipment Co., Buchanan, Mich., has been elected president of the company, succeeding the late Albert S. Bonner. Mr. Spatta has been connected with the organization since 1927, serving successively as development engineer, chief engineer, general manager, and executive vice-president.

JESSE L. POWERS has been made superintendent of the Buick Engine Plant, Factory No. 11, Flint, Mich., succeeding the late Bruce Fonger. He was formerly night superintendent of the plant, and for the last four years has been engaged in employe relations for the manufacturing department.

O. S. LINDEROSE has been appointed manager of the Rite-Way Tool & Mfg. Co., 3502 W. Fort St., Detroit 16, Mich. Mr. Linderose was previously connected with the Trio Tool Co. in a similar capacity.

New England

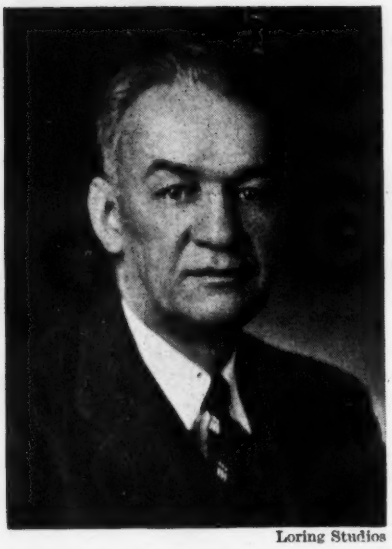
R. LOUIS PIKE has been appointed general sales manager of the Narragansett Machine Co., Providence, R. I. Mr. Pike has had a widely diversified experience, having served as sales promotion and advertising consultant to a number of mid-western firms. Previous to his present connection, he was associated with the Liberty Tool & Gage Works, of Providence, in an executive capacity.

CARL W. BETTCHER was elected president of the Eastern Machine Screw Corporation, New Haven, Conn., manufacturer of H & G die-heads, threading machines, and screw machine products, at the annual meeting of the company. BENJAMIN GREEN, formerly president,

VARD Cylindrical Plug Gages are made in complete range of sizes from No. 0 to 12-in. diameter in XX, X, Y and Z tolerances. They are available in alloy steel; (Timken Graph-Mo); hard chrome; or Norbide, the "hardest material made by man". VARD Norbide gages outwear steel gages 100 times or more.

Each VARD Gage is minutely checked for accuracy on some of the world's most accurate visual and mechanical testing machines. One of these, the Pratt and Whitney measuring machine, checks the diameter of VARD Gages to an accuracy of .00001-in. Use VARD Gages to assure the accuracy of your own fine products.

VARD INC
PASADENA 8, CALIF.



Loring Studios

Carl W. Bettcher, New President of the Eastern Machine Screw Corpn.

was made chairman of the board. In addition to his new duties, Mr. Bettcher will continue to direct sales and advertising. Mr. Bettcher joined the company in 1919 after being mustered out of the American Expeditionary Force as a captain of heavy artillery in France. He is a national authority on screw thread cutting, and is the author of several technical papers and publications on the subject.

C. E. MASON has been appointed technical director of the Bristol Co., Waterbury 91, Conn., manufacturer of automatic control and recording instruments. He was previously director of engineering of the Mason-Neilon Regulator Co. He has made a number of important contributions to the advancement of industrial automatic control design and engineering which have brought him wide recognition. In 1940, he received from the National Association of Manufacturers' Committee on Patents and Research a special award as one of the country's modern pioneers for his accomplishments in this field. He has also written many papers on the basic principles of automatic control, which have been published in the technical journals.

C. E. Mason, Newly Appointed Technical Director of the Bristol Co.

ZENITH ASSOCIATES, 15 Riverdale Ave., Newton 58, Mass., manufacturers of hydraulic motors and fuel pumps, announce that hereafter the firm will be known as THE MCINTYRE CO. The change has been made to avoid confusion arising from the similarity of the old name to that of other manufacturers.

New Jersey

JOHN C. HARROWER was elected vice-president in charge of sales and engineering of Air Associates, Inc., Teterboro, N. J., at a recent meeting of the board of directors.

MANHATTAN RUBBER MFG. DIVISION OF RAYBESTOS-MANHATTAN, INC., Passaic, N. J., has recently been presented with the National Security Award by the United States Office of Civilian Defense.

New York

W. E. REMMERS has been elected vice-president of the Electro Metallurgical Co., a unit of the Union Carbide and Carbon Corporation, 30 E. 42nd St., New York 17, N. Y. Mr. Remmers joined the company at Chicago in 1936, and soon became district manager and later division manager. He was transferred to the New York office in 1941, and last year was elected vice-president of the Electro Metallurgical Sales Corporation.

CAPTAIN GEORGE G. HATHAWAY, of the Air Corps, Production Division, Wright Field, formerly sales manager of the International Detrola Corporation, Indianapolis, Ind., and New York district manager of the Jones & Lamson Co., has joined Giebel, Inc., 250 W. 57th St., New York 19, N. Y., in the capacity of sales engineer.

GENERAL DIE-STAMPING-TOOL CO., 262-272 Mott St., New York 12, N. Y., announces that for the purpose of simplicity the name of the company has been changed back to GENERAL DIE AND STAMPING CO., the name under which the company originally operated. No change has been made in the organization or products.

BENJAMIN O'SHEA was re-elected chairman of the board of directors of the Union Carbide and Carbon Corporation, 30 E. 42nd St., New York 17, N. Y., and FRED H. HAGGERSON was re-elected president at a recent meeting of the board. All the other officers of the corporation were also re-elected.

HYSTER CO., Portland, Ore., has appointed JAMES A. ROACH factory representative for the company covering the Atlantic Seaboard states, with headquarters at 90 West St., New York City. Mr. Roach was previously connected with the Mercury Mfg. Co. in Chicago.

DAVID H. TURNER has been appointed New York manager for the Cincinnati Electrical Tool Co., Cincinnati, Ohio. He was formerly eastern factory representative for the Turner Uni-Drive Co. and Redmer Air Devices Corporation. The R. K. LEBLOND MACHINE TOOL CO., of which the CINCINNATI ELECTRICAL TOOL CO. is a subsidiary, announces that both companies have moved their New York offices to the Singer Bldg., 149 Broadway.

David H. Turner, New York Manager of the Cincinnati Electrical Tool Co.

KENNETH I. THOMPSON, formerly western manager of the railroad department of the Ingersoll-Rand Co., has joined the sales staff of the Oxweld Railroad Service Co., 30 E. 42nd St., New York 17, N. Y., in the capacity of eastern sales manager.

CLEVELAND AUTOMATIC MACHINE CO., Cleveland, Ohio, announces that it has moved its New York sales office to Room 1806, Singer Bldg., 149 Broadway, New York 6, N. Y. This office was formerly located at Newark, N. J. R. T. CARROLL is manager.

MACHINERY'S DATA SHEETS 539 and 540

RECOMMENDED COOLANTS FOR METAL-CUTTING OPERATIONS—1

Material to be Cut	Turning	Milling	Drilling
Aluminum	Mineral Oil with 10 Per Cent Fat (or) Soluble Oil	Soluble Oil (96 Per Cent Water) (or) Mineral Seal Oil (or) Mineral Oil	Soluble Oil (75 to 90 Per Cent Water) (or) 10 Per Cent Lard Oil with 90 Per Cent Mineral Oil
Alloy Steels	25 Per Cent Sulphur-base Oil* with 75 Per Cent Mineral Oil	10 Per Cent Lard Oil with 90 Per Cent Mineral Oil	Soluble Oil
Brass	Mineral Oil with 10 Per Cent Fat	Soluble Oil (96 Per Cent Water)	Soluble Oil (75 to 90 Per Cent Water) (or) 30 Per Cent Lard Oil with 70 Per Cent Mineral Oil
Tool Steels and Low-carbon Steels	25 Per Cent Lard Oil with 75 Per Cent Mineral Oil	Soluble Oil	Soluble Oil
Copper	Soluble Oil	Soluble Oil	Soluble Oil
Monel Metal	Soluble Oil	Soluble Oil	Soluble Oil
Cast Iron	Dry	Dry	Dry
Malleable Iron	Soluble Oil	Soluble Oil	Soluble Oil
Bronze	Soluble Oil	Soluble Oil	Soluble Oil
Magnesium	10 Per Cent Lard Oil with 90 Per Cent Mineral Oil	Mineral Seal Oil	60-second Mineral Oil

*The sulphur-base oil contains 4 1/2 per cent sulphur compound.

MACHINERY'S Data Sheet No. 539, June, 1945 Compiled by James R. Chambers, Lubrication Engineer, Illinois Division, Bendix Aviation Corporation

RECOMMENDED COOLANTS FOR METAL-CUTTING OPERATIONS—2

Material to be Cut	Tapping	Reaming
Aluminum	Lard Oil (or) Sperm Oil (or) Wool Grease (or) 25 Per Cent Sulphur-base Oil* Mixed with Mineral Oil	Mineral Oil with 10 Per Cent Lard Oil
Alloy Steels	30 Per Cent Lard Oil with 70 Per Cent Mineral Oil	25 Per Cent Sulphur-base Oil* with 75 Per Cent Mineral Oil
Brass	10 to 20 Per Cent Lard Oil with Mineral Oil	Mineral Oil
Tool Steels and Low-carbon Steels	25 to 40 Per Cent Lard Oil with Mineral Oil (or) 25 Per Cent Sulphur-base Oil* with 75 Per Cent Mineral Oil	75 Per Cent Mineral Oil with 25 Per Cent Fats
Copper	Soluble Oil	Soluble Oil
Monel Metal	25 to 40 Per Cent Lard Oil Mixed with Mineral Oil (or) Sulphur-base Oil* Mixed with Mineral Oil	75 Per Cent Fats with 25 Per Cent Mineral Oil
Cast Iron	Dry (or) 25 Per Cent Lard Oil with 75 Per Cent Mineral Oil	Dry
Malleable Iron	Soluble Oil	Soluble Oil
Bronze	20 Per Cent Lard Oil with 80 Per Cent Mineral Oil	Soluble Oil
Magnesium	20 Per Cent Lard Oil with 80 Per Cent Mineral Oil	Mineral Oil

*The sulphur-base oil contains 4 1/2 per cent sulphur compound.

MACHINERY'S Data Sheet No. 540, June, 1945 Compiled by James R. Chambers, Lubrication Engineer, Illinois Division, Bendix Aviation Corporation

MACHINERY'S HANDBOOK

The "Bible" of the Mechanical Industry

MACHINERY'S Handbook contains 1815 pages of mechanical tables, rules, formulas and general data needed wherever machines, tools or other mechanical appliances are designed and constructed. It is reliable, complete, and simple in arrangement, and is full of standard data and thoroughly practical information.

Shop men, as well as engineers and designers, find MACHINERY'S Handbook invaluable. It contains the kind of information that is required every day in manufacturing and designing departments.

Price $6—
payable $2 with order,
$2 monthly if desired.

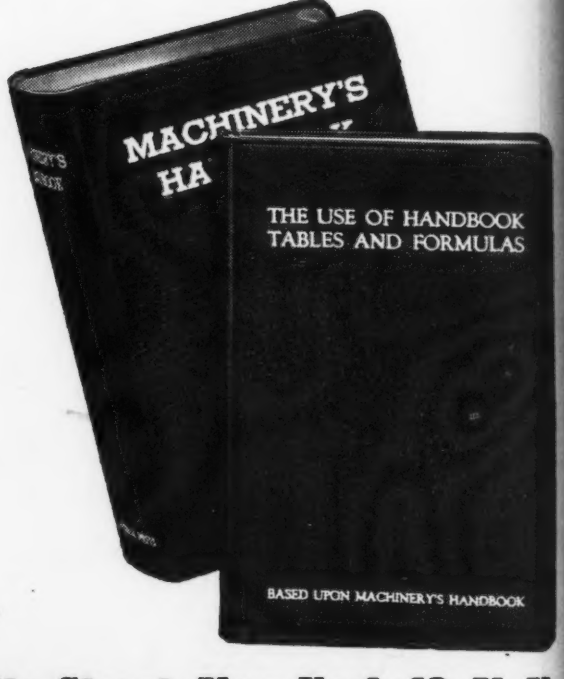
THE INDUSTRIAL PRESS, 148 Lafayette Street, New York 13, N. Y.

THE USE OF HANDBOOK TABLES AND FORMULAS

A companion book which shows you how to get the most out of MACHINERY'S HANDBOOK

This companion book, which costs only $1, serves three purposes: It throws the spotlight on a lot of essential time-saving tables, rules and general information in MACHINERY'S Handbook that the ordinary user never discovers.

A second and equally important function is to show by examples, solutions and test questions, typical applications of handbook matter in both drafting rooms and machine shops. A third object is to provide test questions and drill work designed for use in technical schools and machine-shop training courses so that students will learn at the outset how to apply an engineering handbook.



203 Pages, 63 Illustrations, 500 Problems, Exercises, Test Questions, Price $1; with MACHINERY'S HANDBOOK, $7.

THE INDUSTRIAL PRESS, 148 Lafayette Street, New York 13, N. Y.

Ohio

DUER ENGINEERING CO., 1015 Mahoning Bank Bldg., Youngstown 3, Ohio, has been organized by WALTER PESTRAK and PAUL L. DUER, both of whom have been identified with resistance welding for many years. The new company will represent the PROGRESSIVE WELDER Co., 3050 E. Outer Drive, Detroit 12, Mich., in eastern Ohio and western Pennsylvania. Mr. Duer has been associated with the Progressive Welder Co. as field sales engineer in this area for several years. Mr. Pestrak was formerly connected with the Federal Machine & Welder Co. in the capacity of welding engineer.

C. H. CLARK, vice-president of Robbins & Myers, Inc., Springfield, Ohio, has announced that he will retire at the end of the fiscal year. A. W. MCGREGOR, who joined the Production Control Department of the company in 1919, has been elected executive vice-president of the company, and F. W. SMITH, who started as an engineer in the Motor Division in 1911, has been elected vice-president. W. J. HELMER, who has been selling R & M products since 1916, is now general sales manager.

AULERICH & GRIMES, 8070 E. Circle Drive, Dayton, Ohio, is a new concern formed by A. J. AULERICH and WILLIAM F. GRIMES to represent the PROGRESSIVE WELDER Co., 3050 E. Outer Drive, Detroit 12, Mich., in the western Ohio industrial area. Mr. Aulerich has represented the Progressive Welder Co. in Ohio for many years. Mr. Grimes has a broad background in resistance welding design. He was previously welding engineer with the National Cash Register Co.

WILLIAM J. PERFIELD has been appointed chief engineer of the Mechanical Division of Lear, Inc., Piqua, Ohio. He will supervise work on Lear linear and rotary actuators, flexible shafting, power units, motors, controls, and other mechanical accessories. Mr. Perfield has had a wide range of experience in this work. He was previously chief engineer of the Chicago branch of Air Associates.

COLONEL H. A. TOULMIN, JR., has been elected chairman of the board and president of the Hydraulic Press Mfg. Co., which has two plants in Mount Gilead, Ohio, and a third plant at Wheeling, W. Va. HOWARD F. MACMILLIN, former president, has been elected president of the H-P-M Development Corporation, a subsidiary of the Hydraulic Press Mfg. Co. He will devote his attention to the research work of the corporation. Colonel Toulmin is a member of Toulmin & Toulmin, lawyers of Dayton, Ohio, and Washington, D. C., and will continue the practice of law, in addition to assuming his new duties. He is also a director of the Univis Lens Co., the Univis Corporation, Hydro-Power, Inc., Commonwealth Engineering, and various other corporations.

Colonel H. A. Toulmin, Jr., Chairman of the Board and President of the Hydraulic Press Mfg. Co.

TRACY V. BUCKWALTER, who for the last twenty-five years has served as chief engineer and vice-president of the Timken Roller Bearing Co., Canton, Ohio, retired on April 30 under the company's Retirement Annuity Plan. He will continue to serve the company in a consulting capacity. Mr. Buckwalter became connected with the organization in 1916 as chief engineer after an association of sixteen years with the Pennsylvania Railroad Co. at Altoona, Pa. He was elected vice-president of the company in 1925, and has given most of his time since then to the development of the company's railroad activity.

Tracy V. Buckwalter, Retiring Vice-president of the Timken Roller Bearing Co.

ALBERT L. BERGSTROM was elected vice-president of all engineering for the Timken Roller Bearing Co., Canton 6, Ohio, at a recent meeting of the board of directors. He became connected with the company in 1929 as development engineer, later being made chief works engineer, and prior to his present appointment, he served as executive engineer.

A. W. FREESE has been appointed works manager of the principal plant of the Crosley Corporation, Cincinnati, Ohio. Mr. Freese was formerly vice-president and works manager of the Majestic Radio and Television Co. of Chicago. Previously, he was for eleven years general works manager of the Zenith Radio Corporation, Chicago.

GORHAM W. WOODS has been added to the engineering staff of the Lincoln Electric Co., Cleveland 1, Ohio, manufacturer of arc welding equipment. He will devote the major part of his time to the development of electrodes. For the last three years Mr. Woods has been process engineer of the Dickson Gun Plant at Houston, Tex.

O. J. HORGER, formerly in charge of railway engineering and research with the Timken Roller Bearing Co., Canton 6, Ohio, has been appointed chief engineer of the Railway Division of the company. C. L. EASTBURG has been appointed assistant chief engineer, and P. C. PATERSON will be service manager.

ADMER ASSOCIATES, 49 Central Ave., Room 303, Cincinnati 2, Ohio, have been appointed jobbers for the line of industrial pneumatic tools produced by the ARO EQUIPMENT CORPORATION, Bryan, Ohio. J. W. LITTLETON is local division manager in the territory.

M. C. PECSOK has been elected vice-president of the Osborn Mfg. Co., Cleveland, Ohio, manufacturer of industrial brushes and foundry molding machines. Mr. Pecsok was previously sales manager of the company's brush division.

Pennsylvania

JONES & LAUGHLIN STEEL CORPORATION, Pittsburgh, Pa., announces the following appointments: J. O'H. ANDERSON and H. B. SPACKMAN have been made assistant general managers of sales; V. A. JEVON, assistant general manager of sales in charge of the Pittsburgh district; C. T. HAPGOOD, manager of sales, Tubular Products;

(Left) J. O'H. Anderson, (Center) H. B. Spackman, and (Right) V. A. Jevon, Newly Appointed Assistant General Managers of Sales, Jones & Laughlin Steel Corporation

E. W. HARWELL, district sales manager at Philadelphia; L. C. BERKEY, district sales manager at Chicago; and C. C. WEHLING district sales manager at St. Louis. A change of address of the Chicago office was also announced, the present location being Field Bldg., 135 S. LaSalle St., Chicago 3, Ill. The JONES & LAUGHLIN SUPPLY Co. at Chicago has also been moved to the new location.

COLONIAL G. DEFREEST LARNER has been appointed assistant to the president of the H. K. Porter Co., Inc., Pittsburgh 22, Pa., manufacturer of locomotives, freight cars, process equipment, pumps, castings, and forgings. He will have charge of the termination of war contracts, renegotiation, and special tax problems. Colonel Larner, who was an ace in World War I, has recently returned to an inactive status after more than three and one-half years of duty with the Army Air Forces, both in England and the United States.

JOHN A. COMSTOCK has been appointed director of research and metallurgy for all divisions of the H. K. Porter Co., Inc., Pittsburgh 22, Pa. While Mr. Comstock will maintain technical advisory service for customers on materials and metallurgy, his prime purpose will be to develop new and improved products in the Porter lines. He previously served as engineering metallurgist with the United Aircraft Corporation of East Hartford, Conn.

PITTSBURGH STEEL FOUNDRY CORPORATION, Glassport, Pa., announces the acquisition of a controlling interest in the PITTSBURGH SPRING & STEEL Co. The latter company will be operated under its present name as a division of the Pittsburgh Steel Foundry Corporation. The officers of the Pittsburgh Spring Division are G. D. Thompson, president; E. S. Weidle, vice-president; Winthrop B. Braun, secretary; and M. A. Colvill, treasurer.

BALDWIN LOCOMOTIVE WORKS, Philadelphia, Pa., announces the formation of a Canadian subsidiary at Toronto, Canada, known as the BALDWIN LOCOMOTIVE WORKS OF CANADA, LTD., which will market in Canada such Baldwin products as hydraulic presses, power tools, turbines, water wheels, and Diesel engines.

ALUMINUM CO. OF AMERICA, Pittsburgh 19, Pa., has made a grant of $200,000 to the endowment fund of Carnegie Institute of Technology to establish a professorship of light metals in the Department of Metallurgical Engineering.

WESTINGHOUSE ELECTRIC & MFG. Co., Pittsburgh, Pa., announces that at the annual meeting of the company the stockholders voted to change the company's name to WESTINGHOUSE ELECTRIC CORPORATION for simplicity and brevity.

FREDERICK G. SCHRANZ has been appointed vice-president in charge of hydraulic and special machinery sales of the Continental Foundry & Machine Co., with headquarters at 903 Grant Bldg., Pittsburgh, Pa.

DAVID E. JENKINS, JR., has been made assistant manager of sales of Tate-Jones & Co., Inc., Pittsburgh 30, Pa., manufacturer of industrial furnaces and heat-treating equipment.

GWILYM A. PRICE has been appointed executive vice-president of the Westinghouse Electric Corporation, Pittsburgh, Pa.

Texas

PERRY MACHINERY Co., Dallas, Tex., has been appointed a special distributor of Tocco process induction heat-treatment equipment by the OHIO CRANKSHAFT Co., Cleveland 1, Ohio.

Wisconsin and Minnesota

L. P. SCHRUBEY, formerly in the accounts service department of Ampco Metal, Inc., Milwaukee 4, Wis., has been transferred to the Newark, N. J., field engineering office at 1060 Broad St., Newark 2, N. J., where he will act as field representative. W. F. TAFT, previously connected with the Newark office, has been made field representative at the Cincinnati office, 541 Main Street, Cincinnati 2, Ohio. BAXTER SCHROEDER, of the Cincinnati office, becomes field engineer at Milwaukee for the Ampco-Trode department.

JOHN A. GOUNDREY has been appointed works manager of the Diamond Iron Works, Inc., and the Mahr Mfg. Co. Division, Minneapolis, Minn., manufacturers of construction machinery, industrial furnaces, and ovens. Mr. Goundrey was previously production manager of the Federal Machine & Welder Co., Tank Division, Warren, Ohio.

* * *

Patent Office statistics show that applications for patents in the first four months of 1945 were about 20 per cent greater than for the same period last year, and 40 per cent greater than for the corresponding period in 1943. Apparently the war has not diminished the zest for creating new products for peacetime use.

Make 10 types of prints instead of 1

You can stretch *one* type of print only so far.

But when you use Ozalid, you can match the type of print to the job to be done, with the desired material (paper, cloth, foil or film). You can use your printmaking equipment in *all* departments—with different *colors* (black-line, blue-line, red-line, etc.) to identify the prints.

Ozalid gives you this 10-to-1 advantage because it is unique. Only two steps—exposure and *dry* development—produce positive prints direct from tracings, office forms or other originals.

Here are the ten types of prints you can make in seconds with an Ozalid machine:

1. Black-line on white paper.

2. Blue-line on white paper.

3. Red-line on white paper. For shop and office reproductions of drawings, typed material, forms, etc. Different colors can be used for different departments; to distinguish checked from unchecked prints, etc.

4. Opaque cloth. For exceptionally durable prints for shop use, permanent file copies, etc.

5. Transblack Intermediate.

6. Sepia-line Intermediate.

7. Transparent cloth. For "duplicate originals" to substitute in print production. Lines can be removed with Ozalid corrector fluid—saving invaluable time in making design changes.

8. Transparent foil. For composite or "overlay" prints; for reclaiming old or worn originals; for extra-fast duplicate originals.

9. Chartfilm. For lustrous, black-line prints on durable white plastic base. Oil-proof, waterproof. Cleans with damp rag—no protective covering needed. Ideal for instrument panels, identification cards, etc.

10. Dryphoto. For almost instantaneous, high-quality reproductions of any photographic subject: in black, sepia, or two-tone effect.

ARMY E NAVY

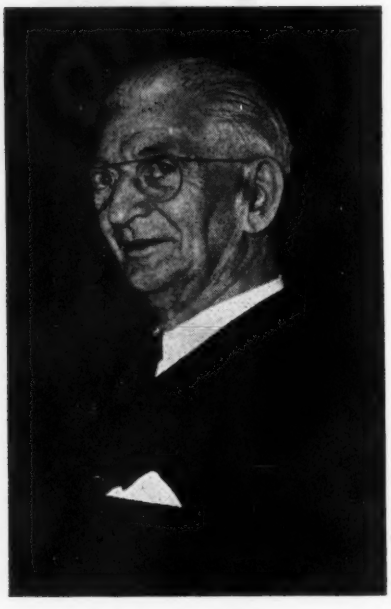
OZALID

For samples of Ozalid's "10 Types" and the whole story, write for free catalogue today.

DIVISION OF GENERAL ANILINE AND FILM CORPORATION · JOHNSON CITY, N. Y.

OZALID IN CANADA—HUGHES-OWENS CO., LTD., MONTREAL

Obituaries



Emil C. Traner

Emil C. Traner, veteran Rockford industrialist and supervisory chairman of the board of the Rockford Clutch Division, Borg-Warner Corporation, died at his home in Rockford on May 7 after a long illness. He was sixty-eight years old.

Mr. Traner was born in Rockford, Ill., in 1876, and spent his entire business career there, retiring last November from the office of president and general manager of the Rockford Clutch Division of the Borg-Warner Corporation. This division was formerly known as the Rockford Drilling Machine Co., with which he became connected as secretary in 1916.

Mr. Traner's industrial activity began as purchasing agent for the Free Sewing Machine Co.; later he became one of the original officers of the National Lock Co. He then became secretary and general manager of the Rockford Drilling Machine Co., and later, when this business was taken over by the Borg-Warner organization, was made president and manager. He was also president of the Mechanics Universal Joint Division of Borg-Warner for six years.

Although his business activities placed great demands on his time, Mr. Traner found the opportunity to devote much effort to civic affairs. He was a member of the Rockford Board of Education and of the Board of Trustees of the Rockford College, which latter honored him by electing him a life honorary trustee. He also was active in the American Red Cross and a charter member of the Emmanuel Lutheran Church in Rockford. He was a director of the American National Bank and Trust Co., and at one time served as vice-president of that institution.

Mr. Traner had an unusually friendly personality, and will be greatly missed by the host of friends that he made throughout his life. He is survived by his widow, Emma Hannblom Traner, whom he married in 1899; one daughter, Lillian; two sisters; and two brothers.

Dr. E. W. Engle

Dr. E. W. Engle, research and consulting metallurgist for Carboloy Company, Inc., Detroit, Mich., died at his home in Detroit on April 26 at the age of fifty-seven. Dr. Engle was recognized as one of the outstanding authorities, not only in this country but in the world, on the subject of tungsten and tungsten-carbide. He was born in Buffalo, Mo., in 1888. After obtaining his Doctor's degree at the University of Illinois, he joined Fansteel Products Co. in 1916 as a chemist and metallurgist, later becoming chief engineer, a position he held until 1932.

Following the first World War, Dr. Engle went to England and set up a tungsten manufacturing plant. In 1930, he set up a fabricating plant for tungsten and molybdenum in France. From 1935 to 1937 he was associated with the Union Wire Die Co., developing processes for the hot-pressing of carbides and for the manufacture of tungsten-carbide dies. When the Union Wire Die Co. was purchased by Carboloy Company in 1937, Dr. Engle became research and consulting metallurgist of the Carboloy Company.

Since 1940 one of his major activities has been the development of tungsten-carbide armor-piercing projectiles of all calibers. During the past year he has been active also on cooperative work for the Office of Scientific Research and Development in Washington. He was appointed technical consultant on the staff of the president of Carboloy Company in January, 1945.

Dr. Engle was a Fellow of the American Association for the Advancement of Science, a member of various technical societies, including the honorary scientific society "Sigma Xi." He is survived by two sons, Edgar W. Engle, Jr., and Robert E. Engle.

Edmund A. Doyle

Edmund A. Doyle, consulting engineer for The Linde Air Products Company, a unit of Union Carbide and Carbon Corporation, New York City, and a former president of the American Welding Society, died suddenly at his home on May 4, at the age of sixty-four years. Mr. Doyle was born in Baltimore, Md., on January 13, 1881. He received his early education at Baltimore, and was graduated from Johns Hopkins University as a mechanical engineer. During the first World War, Mr. Doyle served in the United States Army, Corps of Engineers, starting with the rank of first lieutenant and rising to the rank of major.

Mr. Doyle began his association with The Linde Air Products Company in 1922 as assistant general sales manager in charge of service. Four years later he became consulting engineer on process development, a position he held until his death. One of his early contacts with the field of welding and cutting was in connection with the cutting activities incident to raising the battleship *Maine* from Havana Harbor in 1908.

Mr. Doyle served as a director of the American Welding Society, and was president of that organization in 1930-1931. He was responsible for the organization of the Committee on Building Codes, and was chairman of this committee until his election as president of the Society.

CARL M. FRIDEN, founder and president of the Friden Calculating Machine Co., Inc., San Leandro, Calif., died on Sunday, April 29.

Coming Events

OCTOBER 1-3 — Fall meeting of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS in Cincinnati, Ohio. C. E. Davies, secretary, 29 W. 39th St., New York 18, N. Y.

NOVEMBER 26-30—Annual meeting of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS in New York City. C. E. Davies, secretary, 29 W. 39th St., New York 18, N. Y.

* * *

Ground-Thread Socket Set-Screws

The centerless thread-grinding method developed by the Landis Tool Co., which was described in April MACHINERY, has been adapted to the quantity production of socket set-screws by the Parker-Kalon Corporation, 202 Varick St., New York 14, N. Y. The threads are ground on hardened blanks, giving them a high degree of accuracy in contour and lead. It is stated that a uniform Class 3 fit is assured. Equipment is now being installed by the company to produce ground-thread set-screws in all standard sizes. When sufficient stocks have been built up, they will be released for sale through distributors.